

27198

PRELIMINARY ASSESSMENT

NTD
10/25/95

GASLIGHT COMPANY OF GEORGIA

Prepared for:

**United States
Environmental Protection Agency
Region IV**

Prepared by:

Charles D. Williams

**Charles D. Williams
Acting Unit Coordinator
Georgia Environmental Protection Division
September 29, 1995**

Gaslight Company of Georgia
Columbus, Georgia
September 8, 1995

1. Introduction

Under the authority of the Comprehensive Environmental Response, Compensation, and liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the United States Environmental Protection Agency (EPA) Region IV has authorized the Georgia Environmental Protection Division to conduct a Preliminary Assessment (PA) at the Gaslight Company of Georgia in Columbus, Georgia (Site). The purpose of this investigation was to collect information concerning conditions at the site sufficient to assess the threat posed to human health and the environment and to determine the need for further investigative action. The scope of the investigation included review of available file information, types of hazardous substances associated with the site, identifying potential sources of hazardous releases, a comprehensive survey of targets, and an on and off-site reconnaissance.

2. Site Description, Operational History, and Waste Characteristic

2.1 Location

This Site has been selected for a preliminary assessment due to the past operation as a manufacturing gas plant. The Site is located in the southwest section of the central business district of Columbus, Georgia between the Chattahoochee River and Bay Avenue. The site is bordered on the south by a Georgia Power substation and Dillingham Street and on the North near 12th Street. The Site is currently occupied by Riverwalk Plaza. The site is specifically located at longitude 84 degrees, 52 minutes, 30 seconds West and latitude 32 degrees, 22 minutes, 30 seconds North (Ref. 1).

Muscogee County has long, hot summers because moist tropical air from the Gulf of Mexico persistently covers the area. Winters are cool and fairly short, with only a rare cold wave that moderates in 1 or 2 days. Precipitation is fairly heavy throughout the year, and prolonged droughts are rare. The total annual precipitation is 51.35 inches. Of this, 26 inches, or 50 percent, usually falls in April through September (Ref. 2).

2.2 Site Description

The site is occupied by Riverwalk Plaza which is a river side park. The average ground elevation of the site is 234 feet above mean sea level (MSL). The bank along the Chattahoochee River has a steep 2:1 slope from 234 feet to 190 MSL. The actual site not including the bank is approximately 3 acres. A former manufacture gas plant (MGP) was

located on part of the Riverwalk Plaza from the Dillingham Street Bridge to near 12th street located between Bay Avenue and the Chattahoochee River. The riverside park is comprised of a structural wall stabilizing the steep banks of the river. Within the confines of the wall is a major combined sewer. The new interceptor sewer consists of 2,600 ft of 72-in diameter prestressed concrete cylinder pipe. The pedestrian walkway is 2,400 ft in length, and the reinforced earth retaining wall is 2,000 ft long. The park itself slopes gentle in places from the street level to the wall and contains overlooks and a monument. All areas of the site are sodded or paved (Ref. 3).

2.3 Operational History and Waste Characteristics

Manufactured gas served as major fuel source for domestic and industrial purposes beginning in the early nineteenth century and continuing into the mid-twentieth century. During the coal gasification era, five major manufacturing processes were used: coal carbonization (1816-1950), carbureted water gas (1875-1950), by-product coke ovens (1898-1950), oil gas (1902-1950), and high Btu oil gas (post-1945). A gasification process based on wood was popular prior to the Civil War (1850s). Typical residual wastes from MGP processes included tar, ammoniacal liquor, coke, ash clinker, lampblack, gas purification wastes, tar emulsion, chemical by-products, and sludges. The wastes from a given process depended on the characteristics of the feedstock and the process. The waste materials of primary concern are tars and light oils, which were removed from the gas stream. To a slightly lesser degree, purifier wastes containing cyanide are also of concern, and ash has been noted as a potential problem. Tars make up the most significant waste stream generated by gasification processes. They consist of primarily of polynuclear aromatic hydrocarbons (PAH), including heterocyclic compounds.

The MGP of Columbus probably used pit type water-sealed relief holders for tanks 1 and 2. Tar condensate in these water-sealed relief holders may have provided the contaminant source. Tar from this source can exist in three physical phases. These phases are: heavier-than-water dense, nonaqueous phase liquid (DNAPL), lighter-than-water non-aqueous phase liquid (NAPL), and a solubilized (dissolved) in water phase.

Chemically, the DNAPL phase is made up of the higher specific gravity (greater than 1.0) fraction of the tar, with some light fractions dissolved in it. Because it is heavier than water, its movement through groundwater systems is controlled by directional gradients produced by contrasting permeability of the aquifer materials and the topography of the lower permeability units.

The NAPL fraction is made up primarily of aromatics having a specific gravity of less than 1.0, typically xylene, toluene, and benzene. The behavior of this phase is similar to that of petroleum hydrocarbons, it floats on the water table, and its movement is primarily controlled by the water table gradient.

The dissolved fraction of tar contains those organic materials that are soluble in water.

Movement of this material is entirely dependent on groundwater flow. Concentration of various compounds will depend on their relative biodegradability and sorptive reactions within the aquifer.

Purifiers were used to remove sulfides and nitrogen from the gas streams. They generally consisted of iron oxides presented as bog ore or impregnated wood chips set on purifier racks. Once the purifier materials were “spent” and could not be regenerated, they were disposed.

The historical MGP features are identified by dashed lines on figure 1. These include:

- Holder No. 1 C. 1870
- Holder No. 2 C 1890
- Holder No. 3 C. 1918
- Coal Gasification Area C. 1870-1895
- Purifier Building C. 1890
- Gas Oil Tanks C. 1918
- Water Gas Plant C. 1918
- Purifiers C. 1918

The manufactured gas operations that were conducted using these facilities are the source of MGP materials that are present in the subsurface at the site. The MGP of Columbus was the location for gasification by several processes: wood (1854-1865+/-), coal (1865-1928), and carbureted water (1918-1931). Several characteristic waste materials were encountered at the site. These included free tars, oils, and a limited amount of purifier waste. The chemicals involved are primarily volatile aromatics, phenolics, and PAHs (Ref. 3).

The site was remediated in 1991 by solidification. The project required the removal of overburden from the site. The underlying soil was stabilized with a ten percent mixture of portland cement. In accomplishing the stabilization, an eight foot diameter auger was used to mix the soil and inject the cement down to bedrock (40 feet). An over lapping pattern was used to ensure all soil was stabilized. The over burden was then mixed with cement above ground using a variety of techniques. Finally, two feet of clean fill was place on top of the solidified block. The park was then constructed on top of the site and included sodding and paving of all exposed areas (Ref. 6).

3. Ground Water Pathway

3.1 Hydrogeologic Setting

The site is situated in Muscogee County at the Georgia Fall Line, which separates the Piedmont Physiographic Province from the Coastal Plain Physiographic Province. The

piedmont is composed of crystalline rocks which underlie the Coastal Plain in the study area. The basement crystalline rocks are made up of igneous and metamorphic rocks including granites, gneisses, granite-gneisses, and schists.

The basement rocks are unconformably overlain by the Tuscaloosa Formation in the Columbus area. The crystalline rocks had been deeply weathered by the time the Tuscaloosa sediments were deposited on them. Basal conglomeratic beds within the Tuscaloosa Formation contain angular gravel fragments of resistant vein quartz, reflecting the weathered character of the bedrock.

The Tuscaloosa Formation crops out in the Chattahoochee River area near Columbus. The formation is wedge-shaped, dipping south-southeastward and is approximately 250 feet thick in the Chattahoochee River Valley near Columbus. The Tuscaloosa Formation dates from the Cretaceous period and generally consists of fine-to coarse-grained gravelly, argillaceous, micaceous, cross-bedded, slightly indurated, non-marine sand with layers of mottled clay and silt (Reference).

Stream alluvium and undifferentiated terrace deposits are present along the banks of the Chattahoochee River at the site. These deposits vary in thickness and areal extent and generally are composed of sands and gravel.

The crystalline bedrock underlying the study area generally is impermeable and yields little water except where fractures exist. Although fracture zones may be sources of groundwater, local fracture existence has not been evaluated for potential groundwater supplies. The highly porous and permeable coarse sand and gravel within the overlying Tuscaloosa Formation and in alluvial deposits can provide an excellent aquifer where accumulated sediment thickness is sufficient. The clay and silt layers within the Tuscaloosa Formation are less permeable and may result in perched water. Seepage and springs may occur at the contact with the underlying basement rocks (Ref. 2&4).

3.2 Groundwater Targets

The majority of the population within a 4-mile radius relies on municipal water supplies taken from a reservoir. No groundwater use has been documented in the vicinity of the site during the off-site reconnaissance. USGS well records for Muscogee County do not indicate the existence of any currently used wells throughout the area covered by the Columbus, Georgia 7.5 Minute Quadrangle Map (Ref. 7). Groundwater is known to be withdrawn from alluvial sediments, the Tuscaloosa Formation, and other younger formations further south and east of the site. Census data (Ref. 5) did not find any well within two miles of the site.

3.3 Groundwater Conclusions

A release of hazardous substances from the site to the surficial aquifer is suspected. However, based on the site characteristics, pathway, and target characteristics, there is a

relatively low likelihood of exposure to a hazardous substance. The nearest well is located over two miles from the site. Post remediation groundwater monitoring reports show low levels of MGP waste constituents which are decreasing (Ref. 9).

4.0 Surface Water Pathway

4.1 Hydrologic Setting

Overland drainage from the site flows west into the Chattahoochee River and into storm water drains connected to the City of Columbus waste water treatment plant. The 7 consecutive day 10 year low flow of the Chattahoochee River near Columbus is 1400 cubic feet per second. This flow quantity (7Q10) is the established minimum instantaneous value to be maintained by the Georgia Environmental Protection Division in permitting withdrawals for protection of fisheries (Ref.4). Actual daily average flow of the Chattahoochee River at Columbus is much higher; however, flow varies throughout the day. Surface water exiting the site is suspected of containing little or no hazardous waste constituents. This is due to the placement of two feet of clean fill on the site, and then the paving and sodding of the surface.

4.2 Surface Water Targets

The City of Columbus receives its potable water supply from Lake Oliver. Lake Oliver was formed by damming the Chattahoochee River approximately 3.3 (upriver) miles north of the site. USGS Water Use records indicate that the annual average volume of water withdrawn from Lake Oliver for the City of Columbus in 1989 was 31.217 million gallons per day (Ref.4). Muscogee County is listed as a habitat for the Red-Cockaded Woodpecker and the Cougar both listed as endangered species list (Ref. 10) .

Phenix city, Alabama also withdraws its potable water supply from Lake Oliver. Phenix City withdraws 5 million gallons a day (Ref. 9). Fort Benning is down stream within the 15-mile limit for the surface water usage survey; however, Ft. Benning withdraws its drinking water from the Upatoi River which is a tributary to the Chattahoochee.

4.3 Surface Water Conclusions

There are indication of past releases of contaminants to surface water (Ref. 7). Since the remediation of the site in 1991, no suspected releases of contaminants from surface water are suspected. There are no surface water intakes within 15-miles on the downstream pathway from the site. There are no wetlands within 15-miles downstream due to the Chattahoochee River having a channel flow in this area. Flooding of the river is rare due to its control of flow through a series of lakes and dams.

5.0 Soil Exposure and Air Pathways

5.1 Physical Conditions

In the subsurface borings made by Williams Environmental Services , petroleum hydrocarbons and other man-made materials were discovered at depths ranging from one foot to greater than 35 feet. These materials include asphalt, metal, concrete, and bricks. In many of the borings varying thicknesses of coal, ash, and cinders were also encountered. Intermixed and below these man-made material is also imported fill consisting of a clayey, silty, fine, micaceous sand with occasional quartz pebbles and a medium-to coarse-grained sand grading from orange-brown to dark gray and brown (Ref. 6).

Since remediation, the site was covered with 2 feet of clean fill, sodded and paved (Ref. 7). The site is now occupied by a city park.

5.2 Soil and Air Targets

There are no residents or workers onsite. The nearest resident is within a quarter of a mile of the site (Ref. 5). There are 128,201 (Ref. 5) residents living within the 4 mile radius of the site.

5.3 Soil Exposure and Air Pathway Conclusions

The soil exposure and air pathway appears to pose a minimal threat at the site due to the 2 foot soil cover and the sodding and pavement associated with the park. In addition, no odors or bare spots were observed at the site during the site reconnaissance.

6.0 Summary and Conclusions

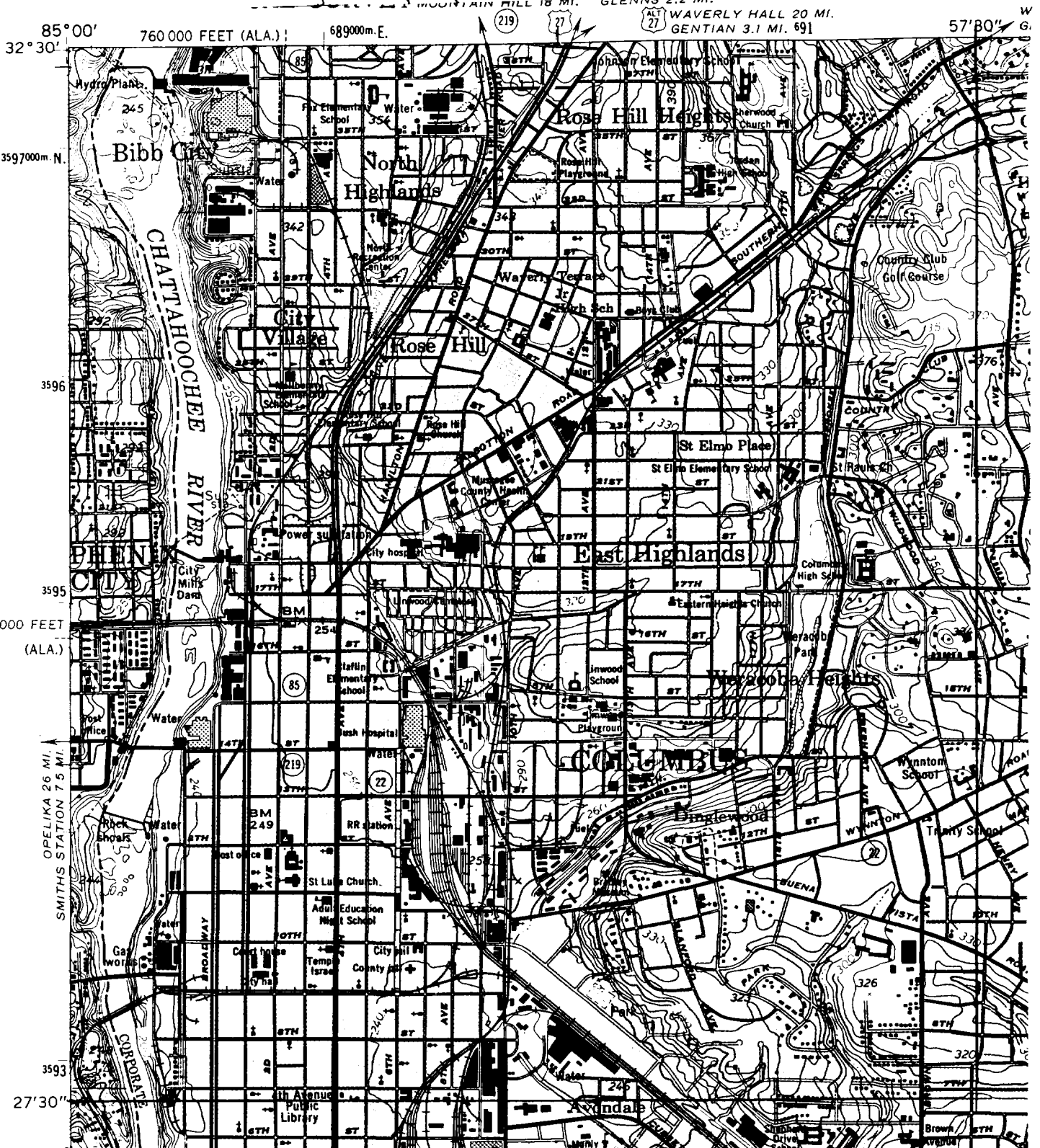
The site was the location of a manufactured gas plant from 1854-1926. During this period of operation, soil at the site were contaminated with MGP waste. In 1991, the site under went remediation. The purpose of the remediation was to make contaminants in the soil immobile. This was accomplished by injecting cement into the soil and mixing it to form a solidified block. The block extends from two feet below the surface down to a low permeability bedrock. Two feet of clean soil was place on top of the block and then a riverwalk park was constructed on top of the clean fill. The park is either sodded or paved. As a result of the remediation and construction of the park, no release to surface water or air is suspected and exposure to soil is unlikely. Groundwater is known to contain MGP waste however no primary targets were identified and the nearest well is located over 1 mile away.

References

1. Latitude and Longitude Calculation Worksheet, Guidance for Performing Preliminary Assessments Under CERCLA, September 1991. Attached
2. Soil Survey of Muscogee County, Georgia, United States Department of Agriculture Soil Conservation Service, April 1983.
3. Georgia Department of Natural Resources Environmental Protection Division Administrative File "Columbus MGP".
4. Water Availability & Use Chattahoochee River Basin, Georgia Department of Natural Resources Environmental Protection Division, 1984.
5. Frost Associates, Contracts Report, Gaslight Company of Georgia. Attached
6. Columbus, Georgia Manufactured Gas Plant Site Investigation and Remediation Report, August 9, 1991, Department of Natural Resources Environmental Protection Divisions Administrative File.
7. Site Reconnaissance , Derrick Williams, Georgia Environmental Protection Division, September 27, 1995.
8. Robert Shriver, Phenix City Water Superintendent, Telephone Conversation September 20, 1995, Re: Phenix City source of Drinking Water.
9. Post Remediation Groundwater Monitoring Report/Third Quarter, Georgia Power Company, January 12, 1994. Attached.
10. Georgia's Protected Wildlife County Cross- Reference. Attached

SITE NAME: Gas Light Company of Columbus

NUMBER:

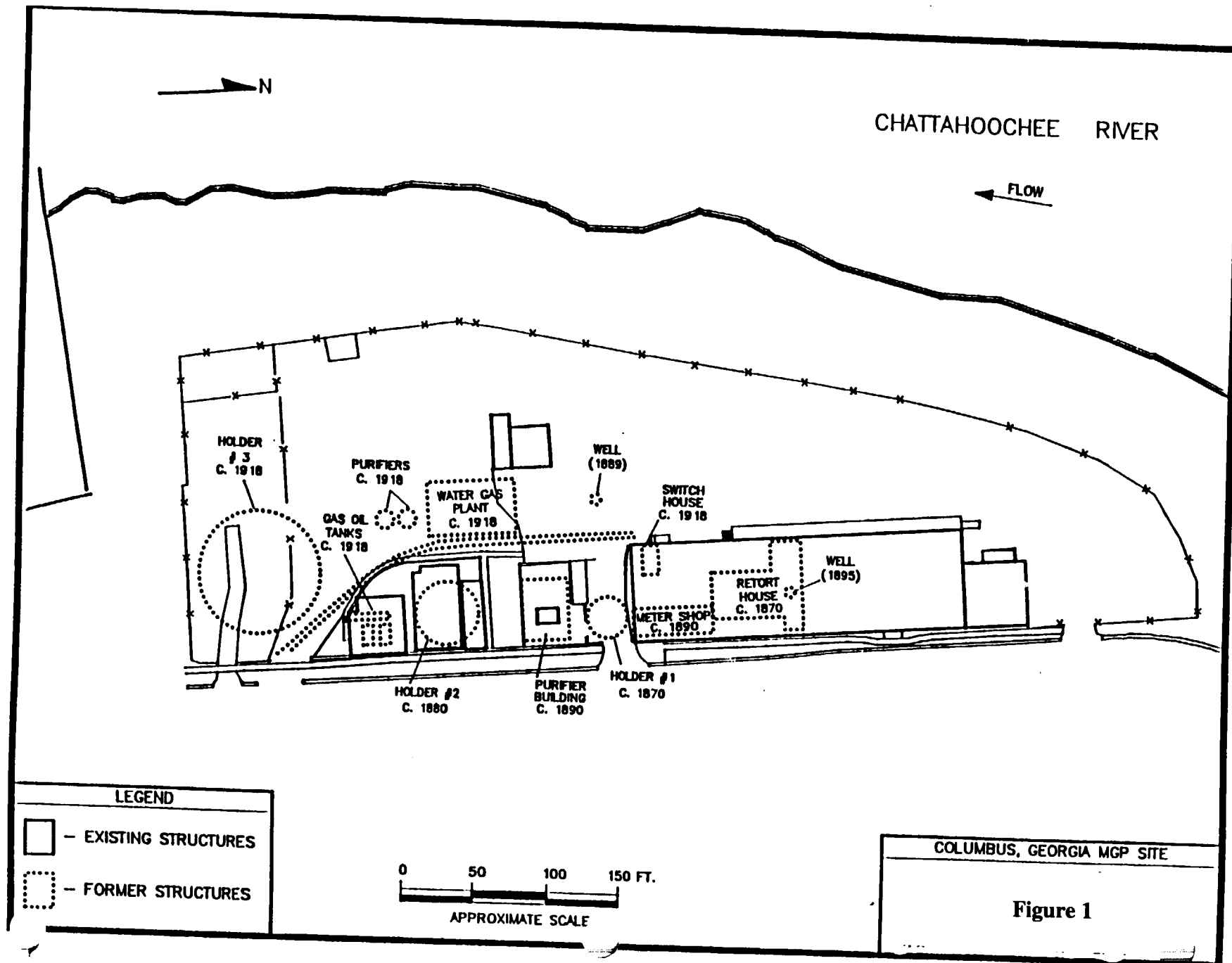


TOPOGRAPHIC MAP QUADRANGLE NAME: Columbus

SCALE: 1:24,000

COORDINATES OF LOWER RIGHT-HAND CORNER OF 2.5-MINUTE GRID:

LATITUDE: 34°57'30" LONGITUDE: 84°27'30"



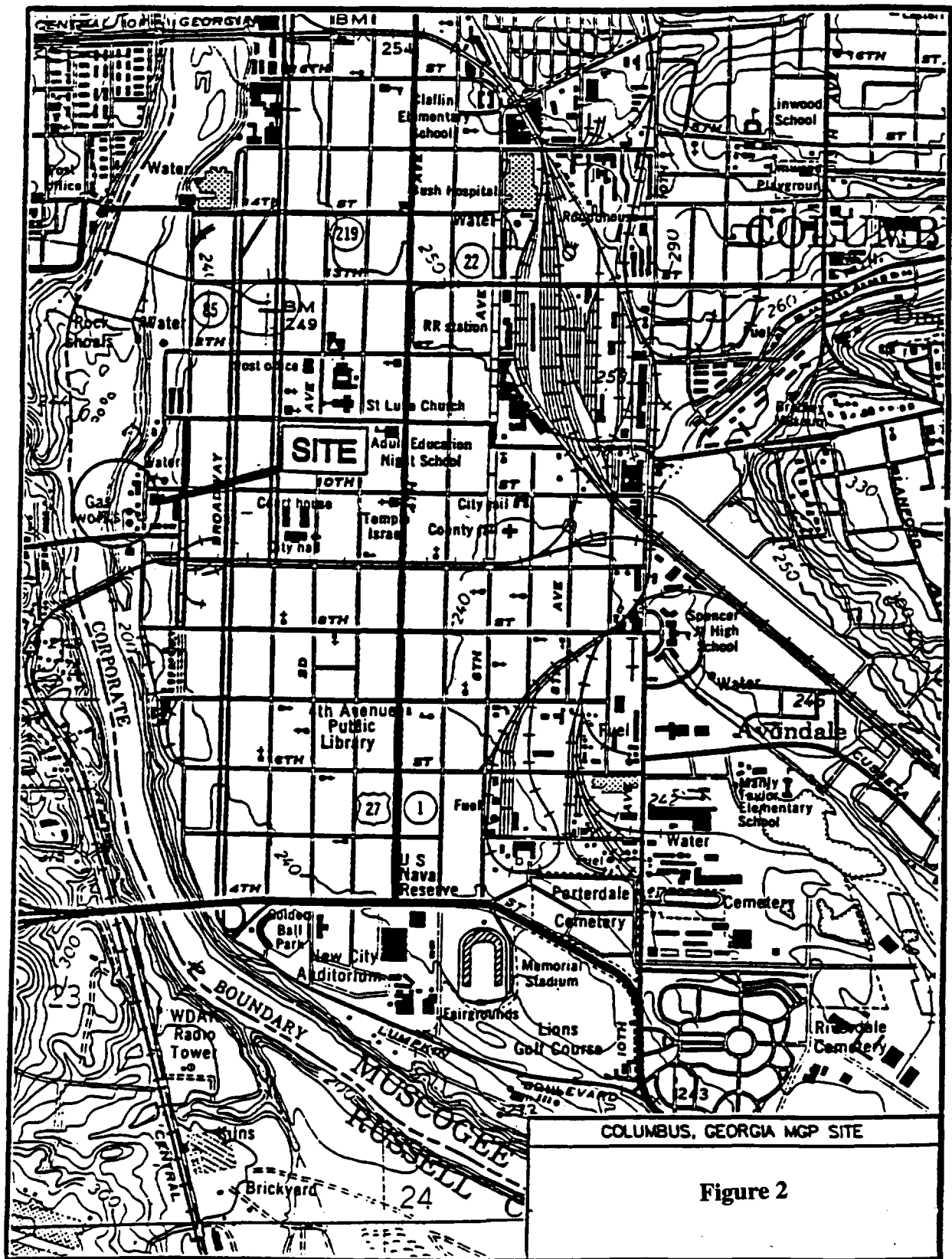
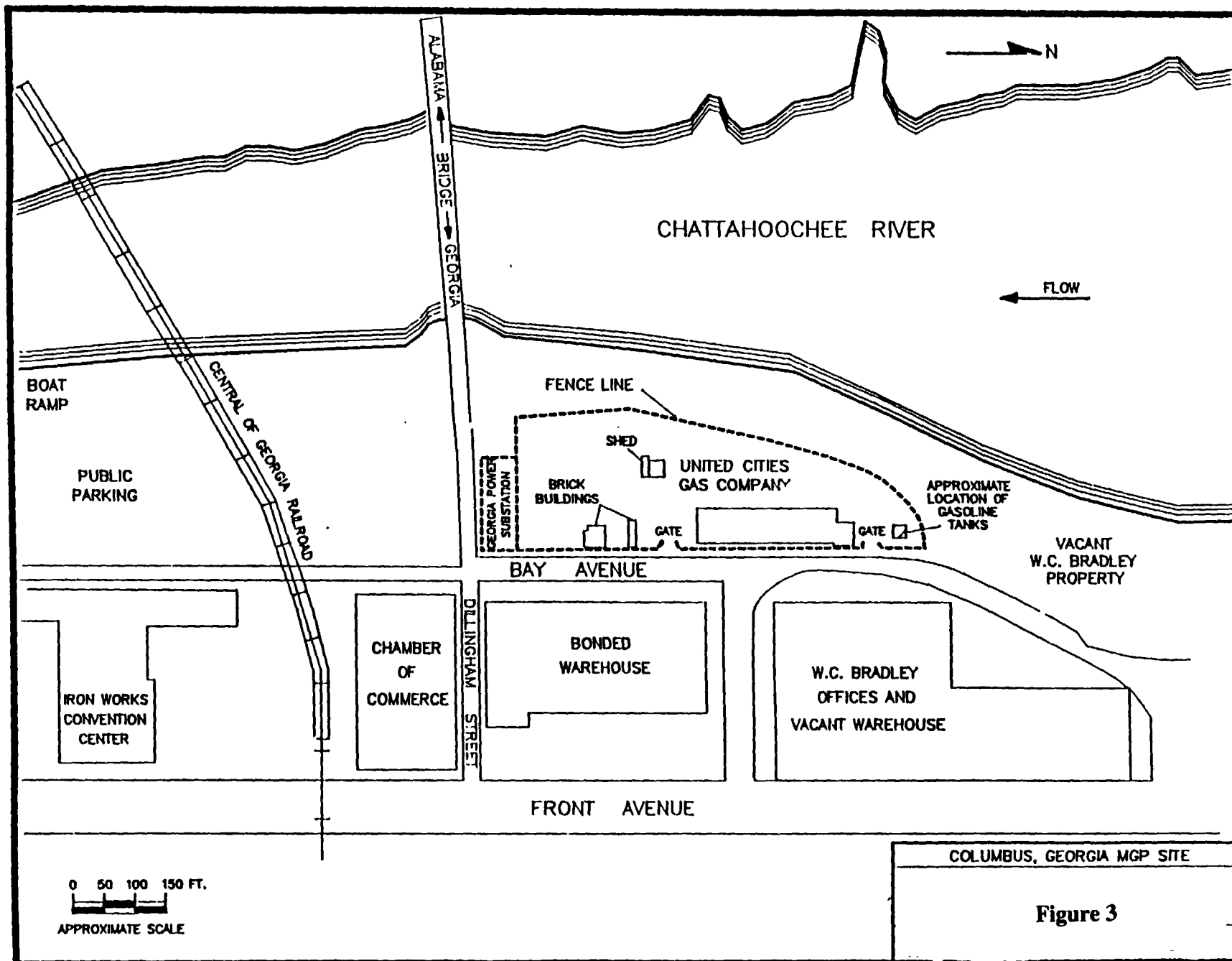


Figure 2



APPENDIX A

OMB Approval Number: 2050-0095
Approved for Use Through: 1/92

PA Scoresheets

Site Name: Gaslight Company of Columbus Investigator: Charles D. Williams

CERCLIS ID No.: None

Agency/Organization: Georgia EPD

Street Address: None

Street Address: 205 Butler Street; Floyd Tower East

City/State/Zip: Columbus, Georgia, 30334

City/State/Zip: Atlanta, Georgia 30334

Date: September 8, 1995

GENERAL INFORMATION**Site Description and Operational History:**

See Narrative 2.2 ~~2.1~~

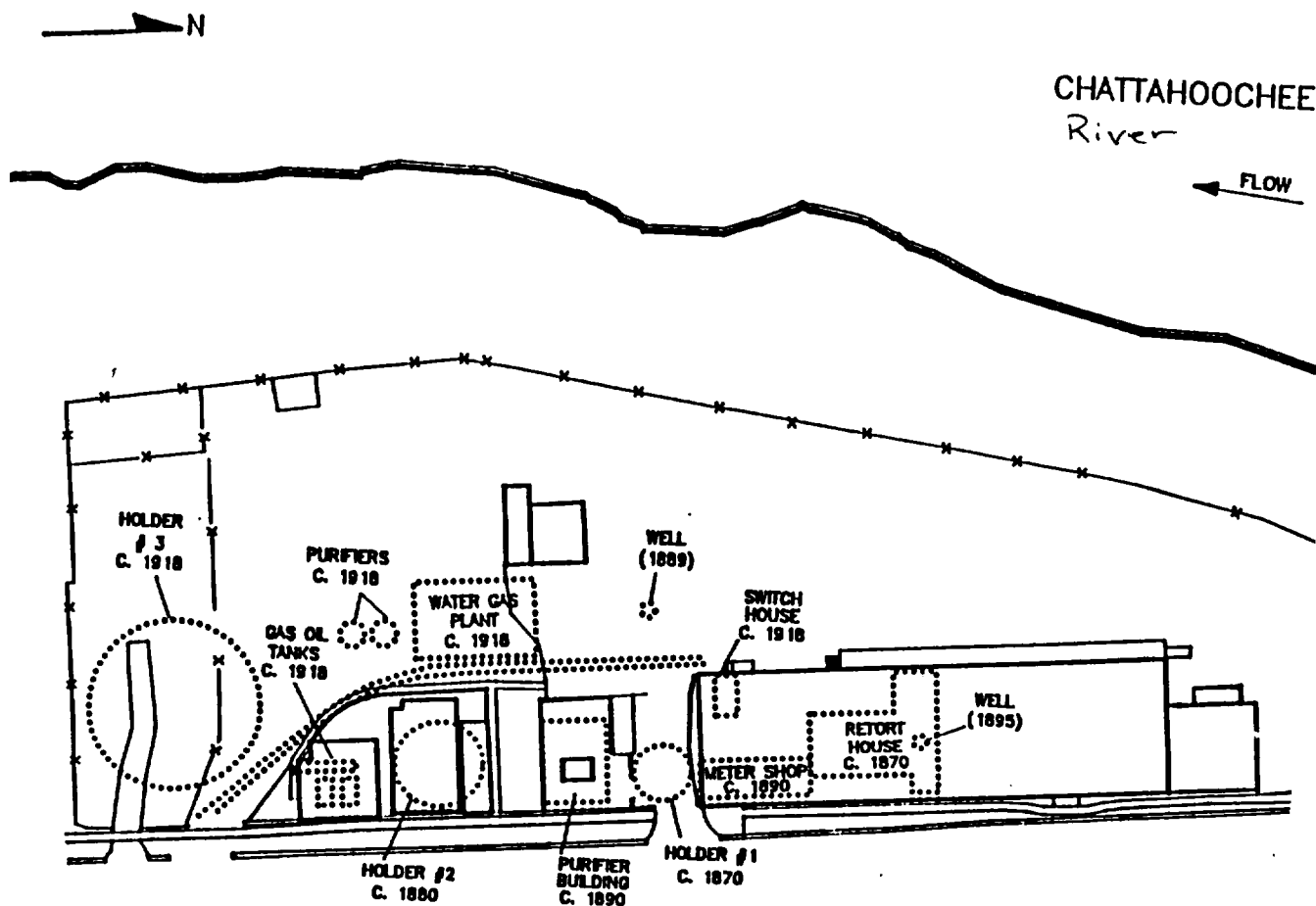
Probable Substances of Concern:
(Previous investigations, analytical data)

See Narrative 2.2

GENERAL INFORMATION (continued)

Site Sketch:

(Show all pertinent features, indicate sources and closest targets, indicate north)



SOURCE EVALUATION

Source No.: 1	Source Name: Coal Tar	Source Waste Quantity (WQ) Calculations:
Source Description:		
Soil contaminated with Coal tar. 1320 yd ³		1320
Soil contaminated with carburated water gas 7,233.		7233
4,862 yd ³ of soil and groundwater at the base of water table.		4862
		13,415 yd ³ Consider as land fill
		18

Source No.:	Source Name:	Source Waste Quantity (WQ) Calculations:
Source Description:		

Source No.:	Source Name:	Source Waste Quantity (WQ) Calculations:
Source Description:		

Site WC:

18

PA TABLE 1: WASTE CHARACTERISTICS (WC) SCORES

PA Table 1a: WC Scores for Single Source Sites and Formulas for Multiple Source Sites

TIER	SOURCE TYPE	SINGLE SOURCE SITES (assigned WC scores)			MULTIPLE SOURCE SITES
		WC = 18	WC = 32	WC = 100	
CONSTITUENT	N/A	≤ 100 lb	> 100 to 10,000 lb	> 10,000 lb	lb + 1
WASTE MASS	N/A	≤ 500,000 lb	> 500,000 to 50 million lb	> 50 million lb	lb + 5,000
VOLUME	Landfill	≤ 6.75 million ft ³ ≤ 250,000 yd ³	> 6.75 million to 675 million ft ³ > 250,000 to 25 million yd ³	> 675 million ft ³ > 25 million yd ³	ft ³ + 67,500 yd ³ + 2,500
	Surface impoundment	≤ 6,750 ft ³ ≤ 250 yd ³	> 6,750 to 675,000 ft ³ > 250 to 25,000 yd ³	> 675,000 ft ³ > 25,000 yd ³	ft ³ + 67.5 yd ³ + 2.5
	Drums	≤ 1,000 drums	> 1,000 to 100,000 drums	> 100,000 drums	drums + 10
	Tanks and non-drum containers	≤ 50,000 gallons	> 50,000 to 5 million gallons	> 5 million gallons	gallons + 500
	Contaminated soil	≤ 6.75 million ft ³ ≤ 250,000 yd ³	> 6.75 million to 675 million ft ³ > 250,000 to 25 million yd ³	> 675 million ft ³ > 25 million yd ³	ft ³ + 67,500 yd ³ + 2,500
	Pile	≤ 6,750 ft ³ ≤ 250 yd ³	> 6,750 to 675,000 ft ³ > 250 to 25,000 yd ³	> 675,000 ft ³ > 25,000 yd ³	ft ³ + 67.5 yd ³ + 2.5
AREA	Other	≤ 6,750 ft ³ ≤ 250 yd ³	> 6,750 to 675,000 ft ³ > 250 to 25,000 yd ³	> 675,000 ft ³ > 25,000 yd ³	ft ³ + 67.5 yd ³ + 2.5
	Landfill	≤ 340,000 ft ² ≤ 7.8 acres	> 340,000 to 34 million ft ² > 7.8 to 780 acres	> 34 million ft ² > 780 acres	ft ² + 3,400 acres + 0.078
	Surface impoundment	≤ 1,300 ft ² ≤ 0.029 acres	> 1,300 to 130,000 ft ² > 0.029 to 2.9 acres	> 130,000 ft ² > 2.9 acres	ft ² + 13 acres + 0.00029
	Contaminated soil	≤ 3.4 million ft ² ≤ 78 acres	> 3.4 million to 340 million ft ² > 78 to 7,800 acres	> 340 million ft ² > 7,800 acres	ft ² + 34,000 acres + 0.78
	Pile*	≤ 1,300 ft ² ≤ 0.029 acres	> 1,300 to 130,000 ft ² > 0.029 to 2.9 acres	> 130,000 ft ² > 2.9 acres	ft ² + 13 acres + 0.00029
	Land treatment	≤ 27,000 ft ² ≤ 0.62 acres	> 27,000 to 2.7 million ft ² > 0.62 to 62 acres	> 2.7 million ft ² > 62 acres	ft ² + 270 acres + 0.0062

1 ton = 2,000 lb = 1 yd³ = 4 drums = 200 gallons

* Use area of land surface under pile, not surface area of pile.

PA Table 1b: WC Scores for Multiple Source Sites

WQ Total	WC Score
> 0 to 100	18
> 100 to 10,000	32
> 10,000	100

**GROUND WATER PATHWAY
GROUND WATER USE DESCRIPTION**

Describe Ground Water Use Within 4-miles of the Site:
(Describe stratigraphy, information on aquifers, municipal and/or private wells)

See Narrative 3.1

Calculations for Drinking Water Populations Served by Ground Water:

See Attachment 5

GROUND WATER PATHWAY CRITERIA LIST	
SUSPECTED RELEASE	PRIMARY TARGETS
<p>Y N U e o n s k</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Are sources poorly contained?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is the source a type likely to contribute to ground water contamination (e.g., wet lagoon)?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is waste quantity particularly large?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is precipitation heavy? > 40 in. yr.</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is the infiltration rate high?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is the site located in an area of karst terrain?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is the subsurface highly permeable or conductive?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is drinking water drawn from a shallow aquifer?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Are suspected contaminants highly mobile in ground water?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Does analytical or circumstantial evidence suggest ground water contamination?</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Other criteria? _____</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> SUSPECTED RELEASE?</p>	<p>Y N U e o n s k</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is any drinking water well nearby?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Has any nearby drinking water well been closed?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Has any nearby drinking water user reported foul-tasting or foul-smelling water?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does any nearby well have a large drawdown or high production rate?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is any drinking water well located between the site and other wells that are suspected to be exposed to a hazardous substance?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does analytical or circumstantial evidence suggest contamination at a drinking water well?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does any drinking water well warrant sampling?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Other criteria? _____</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> PRIMARY TARGET(S) IDENTIFIED?</p>
<p>Summarize the rationale for Suspected Release (attach an additional page if necessary):</p> <p>Monitoring Wells on Site have detected a release</p>	<p>Summarize the rationale for Primary Targets (attach an additional page if necessary):</p> <p>Groundwater in the vicinity of the site is not used as a drinking water source</p>

GROUND WATER PATHWAY SCORESHEET

Pathway Characteristics	
Do you suspect a release (see Ground Water Pathway Criteria List, page 7)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Is the site located in karst terrain?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Depth to aquifer:	<u>30</u> ft
Distance to the nearest drinking water well:	<u> </u> ft

- Ref 9

LIKELIHOOD OF RELEASE

1. SUSPECTED RELEASE: If you suspect a release to ground water (see page 7), assign a score of 550. Use only column A for this pathway.
2. NO SUSPECTED RELEASE: If you do not suspect a release to ground water, and the site is in karst terrain or the depth to aquifer is 70 feet or less, assign a score of 500; otherwise, assign a score of 340. Use only column B for this pathway.

A	B
Suspected Release (550)	No Suspected Release (500 or 340)
550	
LR = 550	

References

TARGETS

3. PRIMARY TARGET POPULATION: Determine the number of people served by drinking water wells that you suspect have been exposed to a hazardous substance from the site (see Ground Water Pathway Criteria List, page 7).
_____ people x 10 = _____
4. SECONDARY TARGET POPULATION: Determine the number of people served by drinking water wells that you do NOT suspect have been exposed to a hazardous substance from the site, and assign the total population score from PA Table 2.
Are any wells part of a blended system? Yes ☐ No ☒
If yes, attach a page to show apportionment calculations.
5. NEAREST WELL: If you have identified a primary target population for ground water, assign a score of 50; otherwise, assign the Nearest Well score from PA Table 2. If no drinking water wells exist within 4 miles, assign a score of zero.
6. WELLHEAD PROTECTION AREA (WHPA): If any source lies within or above a WHPA, or if you have identified any primary target well within a WHPA, assign a score of 20; assign 5 if neither condition holds but a WHPA is present within 4 miles; otherwise assign zero.
7. RESOURCES

(50, 20, 10, 5, 3, 2, or 0)	(20, 10, 5, 3, 2, or 0)
—	
—	
5	
T =	

Refs.

WASTE CHARACTERISTICS

8. A. If you have identified any primary target for ground water, assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.
- B. If you have NOT identified any primary target for ground water, assign the waste characteristics score calculated on page 4.

(100 or 32)	
18	
18	
WC = 18	

GROUND WATER PATHWAY SCORE:

$$\frac{LR \times T \times WC}{82,500}$$

(subject to a maximum of 100)

0.6

PA TABLE 2: VALUES FOR SECONDARY GROUND WATER TARGET POPULATIONS

PA Table 2a: Non-Karst Aquifers

Distance from Site	Population	Nearest Well (choose highest)	Population Served by Wells Within Distance Category										Population Value
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	Greater than 100,000	
0 to ¼ mile	_____	20	1	2	5	16	52	163	521	1,633	5,214	16,325	_____
> ¼ to ½ mile	_____	18	1	1	3	10	32	101	323	1,012	3,233	10,121	_____
> ½ to 1 mile	_____	9	1	1	2	5	17	52	167	522	1,668	5,224	_____
> 1 to 2 miles	<u>12</u>	5	1	1	1	3	9	29	94	294	939	2,938	<u>1</u>
> 2 to 3 miles	<u>40</u>	3	1	1	1	2	7	21	68	212	678	2,122	<u>1</u>
> 3 to 4 miles	<u>30</u>	2	1	1	1	1	4	13	42	131	417	1,308	<u>1</u>
Nearest Well =		<u>5</u>	Score =										<u>3</u>

Ref 5.

PA Table 2b: Karst Aquifers

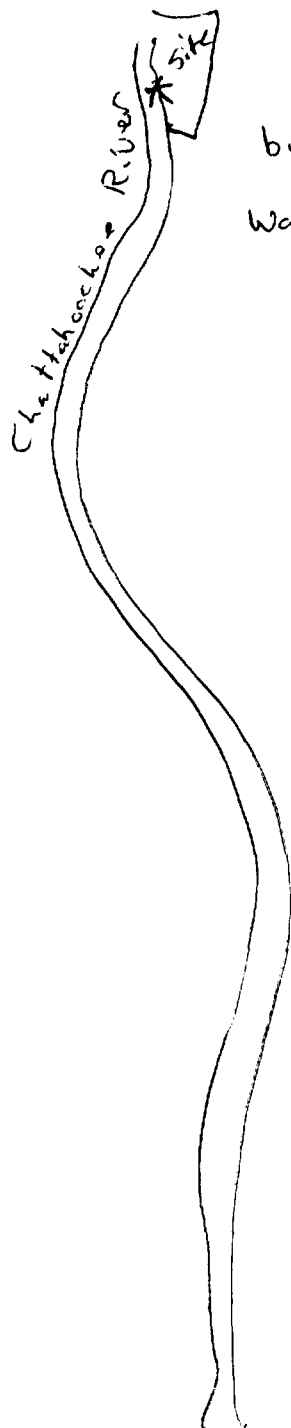
Distance from Site	Population	Nearest Well (use 20 for karst)	Population Served by Wells Within Distance Category										Population Value
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	Greater than 100,000	
0 to ¼ mile	_____	20	1	2	5	16	52	163	521	1,633	5,214	16,325	_____
> ¼ to ½ mile	_____	20	1	1	3	10	32	101	323	1,012	3,233	10,121	_____
> ½ to 1 mile	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
> 1 to 2 miles	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
> 2 to 3 miles	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
> 3 to 4 miles	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
Nearest Well =		_____	Score =										_____

A-17

**SURFACE WATER PATHWAY
MIGRATION ROUTE SKETCH**

Surface Water Migration Route Sketch:

(include runoff route, probable point of entry, 15-mile target distance limit, intakes, fisheries, and sensitive environments)



Probable point of entry would
be at possible seeps in the river
wall or springs under the river.

SURFACE WATER PATHWAY CRITERIA LIST	
SUSPECTED RELEASE	PRIMARY TARGETS
<p>Y N U e o n s k</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is surface water nearby?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is waste quantity particularly large?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is the drainage area large?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is rainfall heavy?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is the infiltration rate low?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Are sources poorly contained or prone to runoff or flooding?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is a runoff route well defined (e.g., ditch or channel leading to surface water)?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is vegetation stressed along the probable runoff route?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Are sediments or water unnaturally discolored?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is wildlife unnaturally absent?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Has deposition of waste into surface water been observed?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is ground water discharge to surface water likely?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Does analytical or circumstantial evidence suggest surface water contamination?</p> <p><input type="checkbox"/> <input type="checkbox"/> Other criteria? _____</p> <p><input type="checkbox"/> <input type="checkbox"/> SUSPECTED RELEASE?</p>	<p>Y N U e o n s k</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Is any target nearby? If yes:</p> <p><input type="checkbox"/> Drinking water intake</p> <p><input checked="" type="checkbox"/> Fishery</p> <p><input type="checkbox"/> Sensitive environment</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Has any intake, fishery, or recreational area been closed?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does analytical or circumstantial evidence suggest surface water contamination at or downstream of a target?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does any target warrant sampling? If yes:</p> <p><input type="checkbox"/> Drinking water intake</p> <p><input type="checkbox"/> Fishery</p> <p><input type="checkbox"/> Sensitive environment</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> Other criteria? _____</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> PRIMARY INTAKE(S) IDENTIFIED?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> PRIMARY FISHERY(IES) IDENTIFIED?</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> PRIMARY SENSITIVE ENVIRONMENT(S) IDENTIFIED?</p>
<p>Summarize the rationale for Suspected Release (attach an additional page if necessary):</p>	<p>Summarize the rationale for Primary Targets (attach an additional page if necessary):</p>

SURFACE WATER PATHWAY LIKELIHOOD OF RELEASE AND DRINKING WATER THREAT SCORESHEET

Pathway Characteristics

Do you suspect a release (see Surface Water Pathway Criteria List, page 11)? Yes ☐ No ☒

Distance to surface water: _____ ft

Flood frequency: _____ yrs

What is the downstream distance to the nearest drinking water intake? 715 miles

Nearest fishery? 0 miles Nearest sensitive environment? _____ miles

LIKELIHOOD OF RELEASE

1. **SUSPECTED RELEASE:** If you suspect a release to surface water (see page 11), assign a score of 550. Use only column A for this pathway.
2. **NO SUSPECTED RELEASE:** If you do not suspect a release to surface water, use the table below to assign a score based on distance to surface water and flood frequency. Use only column B for this pathway.

Distance to surface water \leq 2,500 feet	500
Distance to surface water > 2,500 feet, and	
Site in annual or 10-year floodplain	500
Site in 100-year floodplain	400
Site in 500-year floodplain	300
Site outside 500-year floodplain	100

A	B	
<i>Suspected Release</i>	<i>No Suspected Release</i>	<i>References</i>
(160)		
	(160, 400, 300 or 100)	
(160)	(160, 400, 300 or 100)	
	500	

DRINKING WATER THREAT TARGETS

3. Record the water body type, flow (if applicable), and number of people served by each drinking water intake within the target distance limit. If there is no drinking water intake within the target distance limit, factors 4, 5, and 6 each receive zero scores.

Intake Name	Water Body Type	Flow	People Served
_____	_____	_____ cfs	_____
_____	_____	_____ cfs	_____
_____	_____	_____ cfs	_____

4. **PRIMARY TARGET POPULATION:** If you suspect any drinking water intake listed above has been exposed to a hazardous substance from the site (see Surface Water Pathway Criteria List, page 11), list the intake name(s) and calculate the factor score based on the total population served.

_____ people x 10 = _____

5. **SECONDARY TARGET POPULATION:** Determine the number of people served by drinking water intakes that you do NOT suspect have been exposed to a hazardous substance from the site, and assign the total population score from PA Table 3.

Are any intakes part of a blended system? Yes ☐ No ☐
If yes, attach a page to show apportionment calculations.

6. **NEAREST INTAKE:** If you have identified a primary target population for the drinking water threat (factor 4), assign a score of 50; otherwise, assign the Nearest Intake score from PA Table 3. If no drinking water intake exists within the target distance limit, assign a score of zero.

- ## 7. RESOURCES

(60, 20, 10, 2, 1) = 0	(20, 10, 2, 1) = 0
(8 = 0)	(8 = 0)

Ref 4

Ref 4

Ref 4

T =

PA TABLE 3: VALUES FOR SECONDARY SURFACE WATER TARGET POPULATIONS

Surface Water Body Flow (see PA Table 4)	Population	Nearest Intake (choose highest)	Population Served by Intakes Within Flow Category											Population Value
			1 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	Greater than 1,000,000	
< 10 cfs	_____	20	2	5	16	52	163	521	1,633	5,214	16,325	52,136	163,246	_____
10 to 100 cfs	_____	2	1	1	2	5	16	52	163	521	1,633	5,214	16,325	_____
> 100 to 1,000 cfs	_____	1	0	0	1	1	2	5	16	52	163	521	1,633	_____
> 1,000 to 10,000 cfs	_____	0	0	0	0	0	1	1	2	5	16	52	163	_____
> 10,000 cfs or Great Lakes	_____	0	0	0	0	0	0	0	1	1	2	5	16	1
3-mile Mixing Zone	_____	10	1	3	8	26	82	261	816	2,607	8,162	26,068	81,663	_____
Nearest Intake = _____			Minimum flow for 7 consecutive days in a ten year period, 1400 cfs											Score = 1

Ref 4

PA TABLE 4: SURFACE WATER TYPE / FLOW CHARACTERISTICS
WITH DILUTION WEIGHTS FOR SECONDARY SURFACE WATER SENSITIVE ENVIRONMENTS

Type of Surface Water Body		Dilution Weight
Water Body Type	OR Flow	
minimal stream	< 10 cfs	1
small to moderate stream	10 to 100 cfs	0.1
moderate to large stream	> 100 to 1,000 cfs	N/A
large stream to river	> 1,000 to 10,000 cfs	N/A
large river	> 10,000 cfs	N/A
3-mile mixing zone of quiet flowing streams or rivers	10 cfs or greater	N/A
coastal tidal water (harbors, sounds, bays, etc.), ocean, or Great Lakes	N/A	N/A

**SURFACE WATER PATHWAY (continued)
HUMAN FOOD CHAIN THREAT SCORESHEET**

LIKELIHOOD OF RELEASE

Enter Surface Water Likelihood of Release score from page 12.

LR =

A	B
Suspected Release	No Suspected Release
(550)	(500, 600, 300 = 100)
550	

References

HUMAN FOOD CHAIN THREAT TARGETS

8. Record the water body type and flow (if applicable) for each fishery within the target distance limit. If there is no fishery within the target distance limit, assign a Targets score of 0 at the bottom of the page.

Fishery Name	Water Body Type	Flow
Chattahoochee	River	1400 cfs
		cfs
		cfs
		cfs
		cfs

9. PRIMARY FISHERIES: If you suspect any fishery listed above has been exposed to a hazardous substance from the site (see Surface Water Criteria List, page 11), assign a score of 300 and do not evaluate Factor 10. List the primary fisheries:

10. SECONDARY FISHERIES

- A. If you suspect a release to surface water and have identified a secondary fishery but no primary fishery, assign a score of 210.
- B. If you do not suspect a release, assign a Secondary Fisheries score from the table below using the lowest flow at any fishery within the target distance limit.

Lowest Flow	Secondary Fisheries Score
< 10 cfs	210
10 to 100 cfs	30
> 100 cfs, coastal tidal waters, oceans, or Great Lakes	12

T =

(300, 210 = 0)	(210, 30, 12 = 0)
300	—

(210, 30 = 12)

12

**SURFACE WATER PATHWAY (continued)
ENVIRONMENTAL THREAT SCORESHEET**

LIKELIHOOD OF RELEASE

Enter Surface Water Likelihood of Release score from page 12.

LR =

A	B
Suspected Release (500)	No Suspected Release (100,400,300 = 100)
500	

References

ENVIRONMENTAL THREAT TARGETS

11. Record the water body type and flow (if applicable) for each surface water sensitive environment within the target distance limit (see PA Tables 4 and 5). If there is no sensitive environment within the target distance limit, assign a Targets score of 0 at the bottom of the page.

Environment Name	Water Body Type	Flow
Chattahoochee River	River	1400 cfs
		cfs
		cfs
		cfs
		cfs

12. PRIMARY SENSITIVE ENVIRONMENTS: If you suspect any sensitive environment listed above has been exposed to a hazardous substance from the site (see Surface Water Criteria List, page 11), assign a score of 300 and do not evaluate factor 13. List the primary sensitive environments:

13. SECONDARY SENSITIVE ENVIRONMENTS: If sensitive environments are present, but none is a primary sensitive environment, evaluate Secondary Sensitive Environments based on flow.

- A. For secondary sensitive environments on surface water bodies with flows of 100 cfs or less, assign scores as follows, and do not evaluate part B of this factor:

Flow	Dilution Weight (PA Table 4)	Environment Type and Value (PA Tables 5 and 6)	Total
1400 cfs	NA	x	=
cfs		x	=
cfs		x	=
cfs		x	=
cfs		x	=

Sum =

- B. If all secondary sensitive environments are located on surface water bodies with flows > 100 cfs, assign a score of 10.

T =

300	
300	
0	
10	
10	

Ref 3

PA TABLE 5: SURFACE WATER AND AIR PATHWAY SENSITIVE ENVIRONMENTS VALUES

<i>Sensitive Environment</i>	<i>Assigned Value</i>
Critical habitat for Federally designated endangered or threatened species	100
Marine Sanctuary	
National Park	
Designated Federal Wilderness Area	
Ecologically important areas identified under the Coastal Zone Wilderness Act	
Sensitive Areas identified under the National Estuary Program or Near Coastal Water Program of the Clean Water Act	
Critical Areas Identified under the Clean Lakes Program of the Clean Water Act (subareas in lakes or entire small lakes)	
National Monument (air pathway only)	
National Seashore Recreation Area	
National Lakeshore Recreation Area	
Habitat known to be used by Federally designated or proposed endangered or threatened species	75
National Preserve	
National or State Wildlife Refuge	
Unit of Coastal Barrier Resources System	
Federal land designated for the protection of natural ecosystems	
Administratively Proposed Federal Wilderness Area	
Spawning areas critical for the maintenance of fish/shellfish species within a river system, bay, or estuary	
Migratory pathways and feeding areas critical for the maintenance of anadromous fish species in a river system	
Terrestrial areas utilized for breeding by large or dense aggregations of vertebrate animals (air pathway) or semi-aquatic foragers (surface water pathway)	
National river reach designated as Recreational	
Habitat known to be used by State designated endangered or threatened species	50
Habitat known to be used by a species under review as to its Federal endangered or threatened status	
Coastal Barrier (partially developed)	
Federally designated Scenic or Wild River	
State land designated for wildlife or game management	25
State designated Scenic or Wild River	
State designated Natural Area	
Particular areas, relatively small in size, important to maintenance of unique biotic communities	
State designated areas for protection/maintenance of aquatic life under the Clean Water Act	5
Wetlands	See PA Table 6 (Surface Water Pathway) or PA Table 9 (Air Pathway)

PA TABLE 6: SURFACE WATER PATHWAY
WETLANDS FRONTAGE VALUES

<i>Total Length of Wetlands</i>	<i>Assigned Value</i>
Less than 0.1 mile	0
0.1 to 1 mile	25
Greater than 1 to 2 miles	50
Greater than 2 to 3 miles	75
Greater than 3 to 4 miles	100
Greater than 4 to 8 miles	150
Greater than 8 to 12 miles	250
Greater than 12 to 16 miles	350
Greater than 16 to 20 miles	450
Greater than 20 miles	500

**SURFACE WATER PATHWAY (concluded)
WASTE CHARACTERISTICS, THREAT, AND PATHWAY SCORE SUMMARY**

WASTE CHARACTERISTICS	A	B
	<i>Suspected Release</i>	<i>No Suspected Release</i>
14. A. If you have identified any primary target for surface water (pages 12, 14, or 15), assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.	(100 ÷ 32) 32	
B. If you have NOT identified any primary target for surface water, assign the waste characteristics score calculated on page 4.	(100, 32, or 18) —	(100, 32, or 18)
WC =	32	

SURFACE WATER PATHWAY THREAT SCORES

Threat	<i>Likelihood of Release (LR) Score (from page 12)</i>	<i>Targets (T) Score (pages 12, 14, 15)</i>	<i>Pathway Waste Characteristics (WC) Score (determined above)</i>	<i>Threat Score LR x T x WC / 82,500</i>
Drinking Water	500	0	32	(subject to a maximum of 100) 0
Human Food Chain	500	12	32	(subject to a maximum of 100) 2.3
Environmental	500	10	32	(subject to a maximum of 80) 2.1

SURFACE WATER PATHWAY SCORE
(Drinking Water Threat + Human Food Chain Threat + Environmental Threat)

(subject to a maximum of 100) 4.4

SOIL EXPOSURE PATHWAY CRITERIA LIST	
SUSPECTED CONTAMINATION	RESIDENT POPULATION
<p>Surficial contamination can generally be assumed.</p>	<p>Y N U e o n s k</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is any residence, school, or daycare facility on or within 200 feet of an area of suspected contamination?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is any residence, school, or daycare facility located on adjacent land previously owned or leased by the site owner/operator?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Is there a migration route that might spread hazardous substances near residences, schools, or daycare facilities?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Have onsite or adjacent residents or students reported adverse health effects, exclusive of apparent drinking water or air contamination problems?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does any neighboring property warrant sampling?</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> Other criteria? _____</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> RESIDENT POPULATION IDENTIFIED?</p>
<p>Summarize the rationale for Resident Population (attach an additional page if necessary):</p> <p>The entire site was cover by 2 feet of fill and either soil covered with soil or paved.</p>	

SOIL EXPOSURE PATHWAY SCORESHEET

Pathway Characteristics	
Do any people live on or within 200 ft of areas of suspected contamination?	Yes ___ No <u>X</u>
Do any people attend school or daycare on or within 200 ft of areas of suspected contamination?	Yes ___ No <u>X</u>
Is the facility active? Yes ___ No <u>X</u> If yes, estimate the number of workers: _____	

LIKELIHOOD OF EXPOSURE

1. SUSPECTED CONTAMINATION: Surficial contamination can generally be assumed, and a score of 550 assigned. Assign zero only if the absence of surficial contamination can be confidently demonstrated.

LE =

Suspected Contamination (550 = 0)
550

References

Ref 6

RESIDENT POPULATION THREAT TARGETS

2. RESIDENT POPULATION: Determine the number of people occupying residences or attending school or daycare on or within 200 feet of areas of suspected contamination (see Soil Exposure Pathway Criteria List, page 18).

_____ people x 10 =

0

3. RESIDENT INDIVIDUAL: If you have identified a resident population (factor 2), assign a score of 50; otherwise, assign a score of 0.

0

4. WORKERS: Use the following table to assign a score based on the total number of workers at the facility and nearby facilities with suspected contamination:

Number of Workers	Score
0	0
1 to 100	5
101 to 1,000	10
> 1,000	15

0

5. TERRESTRIAL SENSITIVE ENVIRONMENTS: Use PA Table 7 to assign a value for each terrestrial sensitive environment on an area of suspected contamination:

Terrestrial Sensitive Environment Type	Value
_____	_____
_____	_____
_____	_____

Sum =

0

6. RESOURCES

0

T =

0

WASTE CHARACTERISTICS

7. Assign the waste characteristics score calculated on page 4.

WC =

(100, 32, or 10)

32

RESIDENT POPULATION THREAT SCORE:

$$\frac{LE \times T \times WC}{82,500}$$

(Adjust to a maximum of 100)
0

NEARBY POPULATION THREAT SCORE:

(1, 2, or 11)
0

SOIL EXPOSURE PATHWAY SCORE:

Resident Population Threat + Nearby Population Threat

(Adjust to a maximum of 100)
0

**PA TABLE 7: SOIL EXPOSURE PATHWAY
TERRESTRIAL SENSITIVE ENVIRONMENT VALUES**

<i>Terrestrial Sensitive Environment</i>	<i>Assigned Value</i>
Terrestrial critical habitat for Federally designated endangered or threatened species	100
National Park	
Designated Federal Wilderness Area	
National Monument	
Terrestrial habitat known to be used by Federally designated or proposed threatened or endangered species	75
National Preserve (terrestrial)	
National or State terrestrial Wildlife Refuge	
Federal land designated for protection of natural ecosystems	
Administratively proposed Federal Wilderness Area	
Terrestrial areas utilized by large or dense aggregations of animals (vertebrate species) for breeding	
Terrestrial habitat used by State designated endangered or threatened species	50
Terrestrial habitat used by species under review for Federal designated endangered or threatened status	
State lands designated for wildlife or game management	25
State designated Natural Areas	
Particular areas, relatively small in size, important to maintenance of unique biotic communities	

AIR PATHWAY CRITERIA LIST	
SUSPECTED RELEASE	PRIMARY TARGETS
Y N U e o n s k <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Are odors currently reported? <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Has release of a hazardous substance to the air been directly observed? <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Are there reports of adverse health effects (e.g., headaches, nausea, dizziness) potentially resulting from migration of hazardous substances through the air? <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Does analytical or circumstantial evidence suggest a release to the air? <input type="checkbox"/> <input type="checkbox"/> Other criteria? _____ <input type="checkbox"/> <input checked="" type="checkbox"/> SUSPECTED RELEASE?	If you suspect a release to air, evaluate all populations and sensitive environments within 1/4 mile (including those onsite) as primary targets.
Summarize the rationale for Suspected Release (attach an additional page if necessary):	

AIR PATHWAY SCORESHEET

Pathway Characteristics	
Do you suspect a release (see Air Pathway Criteria List, page 21)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Distance to the nearest individual:	_____ ft

LIKELIHOOD OF RELEASE

- SUSPECTED RELEASE:** If you suspect a release to air (see page 21), assign a score of 550. Use only column A for this pathway.
- NO SUSPECTED RELEASE:** If you do not suspect a release to air, assign a score of 500. Use only column B for this pathway.

	A	B	References
	Suspected Release	No Suspected Release	
	(550)	(500)	
LR =		500	

TARGETS

- PRIMARY TARGET POPULATION:** Determine the number of people subject to exposure from a suspected release of hazardous substances to the air.
_____ people x 10 = _____
- SECONDARY TARGET POPULATION:** Determine the number of people not suspected to be exposed to a release to air, and assign the total population score using PA Table 8.
- NEAREST INDIVIDUAL:** If you have identified any Primary Target Population for the air pathway, assign a score of 50; otherwise, assign the Nearest Individual score from PA Table 8.
- PRIMARY SENSITIVE ENVIRONMENTS:** Sum the sensitive environment values (PA Table 5) and wetland acreage values (PA Table 9) for environments subject to exposure from a suspected release to the air.

Sensitive Environment Type	Value
_____	_____
_____	_____
_____	_____

Sum =

- SECONDARY SENSITIVE ENVIRONMENTS:** Use PA Table 10 to determine the score for secondary sensitive environments.
- RESOURCES**

T =

		119	
(50, 20, 7, 2, 1, or 0)	(50, 20, 7, 2, 1, or 0)		
		7.5	
(5 or 0)	(5 or 0)		
T =		126.5	

WASTE CHARACTERISTICS

- If you have identified any Primary Target for the air pathway, assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.
 - If you have NOT identified any Primary Target for the air pathway, assign the waste characteristics score calculated on page 4.

WC =

(100 or 32)	
(100, 32, or 18)	(100, 32, or 18)
18	
18	

AIR PATHWAY SCORE:

$$\frac{LR \times T \times WC}{82,500}$$

(subject to a maximum of 100)
13.8

PA TABLE 8: VALUES FOR SECONDARY AIR TARGET POPULATIONS

Distance from Site	Population	Nearest Individual (choose highest)	Population Within Distance Category												Population Value	
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	Greater than 1,000,000		
Onsite	0	20	1	2	5	16	52	163	521	1,633	5,214	16,325	52,136	163,246	0	
>0 to ¼ mile	1085	20	1	1	1	4	13	41	130	408	1,303	4,081	13,034	40,811	41	
> ¼ to ½ mile	2410	2	0	0	1	1	3	9	28	88	282	882	2,815	8,815	9	
> ½ to 1 mile	10060	1	0	0	0	1	1	3	8	26	83	261	834	2,612	26	
> 1 to 2 miles	25576	0	0	0	0	0	1	1	3	8	27	83	266	833	8	
> 2 to 3 miles	41417	0	0	0	0	0	1	1	1	4	12	38	120	376	12	
> 3 to 4 miles	128207	0	0	0	0	0	0	1	1	2	7	23	73	229	23	
Nearest Individual =															Score =	119

PA TABLE 9: AIR PATHWAY VALUES FOR WETLAND AREA

Wetland Area	Assigned Value
Less than 1 acre	0
1 to 50 acres	25
Greater than 50 to 100 acres	75
Greater than 100 to 150 acres	125
Greater than 150 to 200 acres	175
Greater than 200 to 300 acres	250
Greater than 300 to 400 acres	350
Greater than 400 to 500 acres	450
Greater than 500 acres	500

PA TABLE 10: DISTANCE WEIGHTS AND CALCULATIONS FOR AIR PATHWAY SECONDARY SENSITIVE ENVIRONMENTS

Distance	Distance Weight	Sensitive Environment Type and Value (from PA Table 5 or 9)	Product
Onsite	0.10	x 75 Spawning	7.5
		x	
		x	
0-1/4 mi	0.025	x	
		x	
		x	
1/4-1/2 mi	0.0054	x	
		x	
		x	
Total Environments Score =			3

SITE SCORE CALCULATION

	S	S ²
GROUND WATER PATHWAY SCORE (S _{gw}):	.6	.36
SURFACE WATER PATHWAY SCORE (S _{sw}):	4.4	19.3
SOIL EXPOSURE PATHWAY SCORE (S _s):	0	0
AIR PATHWAY SCORE (S _a):	13.8	190.4
SITE SCORE:	$\sqrt{\frac{S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2}{4}}$	7.6

SUMMARY

	YES	NO
1. Is there a high possibility of a threat to any nearby drinking water well(s) by migration of a hazardous substance in ground water? A. If yes, identify the well(s). _____ B. If yes, how many people are served by the threatened well(s)? _____	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Is there a high possibility of a threat to any of the following by hazardous substance migration in surface water? A. Drinking water intake B. Fishery C. Sensitive environment (wetland, critical habitat, others) D. If yes, identify the target(s). _____ _____ _____	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
3. Is there a high possibility of an area of surficial contamination within 200 feet of any residence, school, or daycare facility? If yes, identify the property(ies) and estimate the associated population(s). _____ _____ _____	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. Are there public health concerns at this site that are not addressed by PA scoring considerations? If yes, explain: _____ _____ _____ _____	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Reference 1
Attachment 1

LATITUDE AND LONGITUDE CALCULATION WORKSHEET #2
LI USING ENGINEER'S SCALE (1/60)

SITE NAME: Gas Light Company of Columbus CERCLIS #: None

AKA: Bay Avenue MGP SSID: None

ADDRESS: 945 Bay Avenue

CITY: Columbus STATE: Georgia ZIP CODE: 31993

SITE REFERENCE POINT: Northeast Corner of Dillingham Street Bridge

USGS QUAD MAP NAME: Columbus TOWNSHIP: N/S RANGE: E/W

SCALE: 1:24,000 MAP DATE: 1955 Revised 93 SECTION: 1/4 1/4 1/4

MAP DATUM: 1927 (1983) (CIRCLE ONE) MERIDIAN:

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 7.5' MAP (attach photocopy):

LONGITUDE: 84° 52' 30" LATITUDE: 32° 22' 30"

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 2.5' GRID CELL:

LONGITUDE: 84° 57' 30" LATITUDE: 32° 27' 30"

CALCULATIONS: LATITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM LATITUDE GRID LINE TO SITE REF POINT: 56

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:

$$A \times 0.3304 = \underline{18.5} "$$

C) EXPRESS IN MINUTES AND SECONDS (1' = 60"): 0' 18.5"

D) ADD TO STARTING LATITUDE: 32° 27' 30.0" + 0' 18.5" =

SITE LATITUDE: 32° 27' 48.5"

CALCULATIONS: LONGITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM RIGHT LONGITUDE LINE TO SITE REF POINT: 414

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:

$$A \times 0.3304 = \underline{136.8} "$$

C) EXPRESS IN MINUTES AND SECONDS (1' = 60"): 2' 16.8"

D) ADD TO STARTING LONGITUDE: 84° 57' 30.0" + 2' 16.8" =

SITE LONGITUDE: 84° 59' 46.8"

INVESTIGATOR: Charles D. Williams DATE: 3/15/95



United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
University of Georgia
College of Agriculture
Agricultural Experiment
Stations and
The Consolidated
Government of
Columbus, Georgia

Attachment #2

Soil Survey of Muscogee County, Georgia



soil survey of Muscogee County, Georgia

by John H. Johnson, Soil Conservation Service

fieldwork by Steve K. Higgins, Mark S. Hodges, John H. Johnson,
and Mack Thomas, Jr., Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with the University of Georgia
College of Agriculture, Agricultural Experiment Stations
and The Consolidated Government of Columbus, Georgia

MUSCOGEE COUNTY is in the west-central part of Georgia. It is nearly rectangular and has a land area of 144 square miles, or 141,056 acres. Muscogee County is about 22 miles at its widest point and about 20 miles at its longest point. Columbus, the county seat and largest city, is in the western part of the county near the head of navigation on the Chattahoochee River. It is the primary trade center for west-central Georgia and east-central Alabama.

Muscogee County is in three major land resource areas. The northern part of the county is in the Southern Piedmont, most of the eastern part is in the Carolina and Georgia Sand Hills, and much of the southwestern part is in the Southern Coastal Plain.

The Southern Piedmont consists mostly of very gently sloping to steep, well drained soils on uplands. These soils have a loamy surface layer and a clayey subsoil. The Carolina and Georgia Sand Hills are dominantly very gently sloping to moderately steep, well drained soils on uplands. These soils commonly have a thick sandy surface layer and subsurface layer and a loamy subsoil. In places, the subsoil is mostly firm and brittle. The Southern Coastal Plain is made up mostly of nearly level to gently sloping, well drained soils on uplands. These soils have a sandy or loamy surface layer and a loamy subsoil.

About 17 percent of Muscogee County is nearly level alluvial plains and stream terraces. The soils on alluvial plains near the Chattahoochee River and its tributaries are well drained to poorly drained. They are dominantly

loamy throughout. Soils on stream terraces are well drained and moderately well drained. They have a loamy surface layer and a loamy or clayey subsoil.

general nature of the county

This section gives general information about Muscogee County. It discusses climate; settlement and history; and physiography, relief, and drainage.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Muscogee County has long, hot summers because moist tropical air from the Gulf of Mexico persistently covers the area. Winters are cool and fairly short, with only a rare cold wave that moderates in 1 or 2 days. Precipitation is fairly heavy throughout the year, and prolonged droughts are rare. Summer precipitation, mainly afternoon thundershowers, is adequate for all crops.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Columbus, Georgia in the period 1951 to 1977. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 48 degrees F, and the average daily minimum temperature is 37 degrees. The lowest temperature on record, which

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-77 at
Columbus, Georgia]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 11	March 24	April 8
2 years in 10 later than--	March 3	March 17	April 2
5 years in 10 later than--	February 16	March 4	March 21
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 1	October 27
2 years in 10 earlier than--	November 24	November 8	October 31
5 years in 10 earlier than--	December 10	November 22	November 7

TABLE 3.--GROWING SEASON

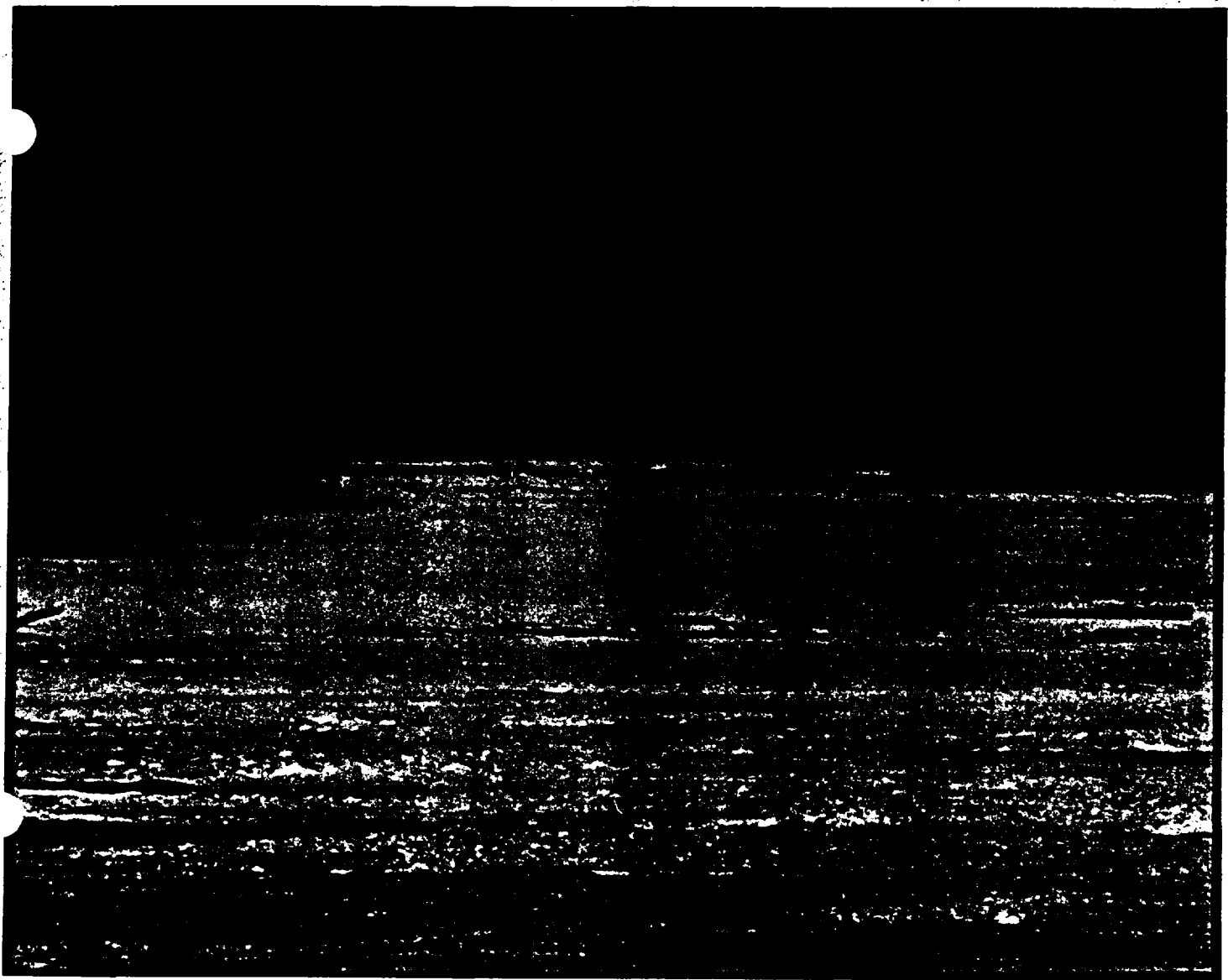
[Recorded in the period 1951-77 at
Columbus, Georgia]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	265	234	208
8 years in 10	276	244	216
5 years in 10	296	262	230
2 years in 10	316	281	245
1 year in 10	327	291	253

TABLE 1.--TEMPERATURE AND PRECIPITATION
[Recorded in the period 1951-77 at Columbus, Georgia]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days ¹	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>		<u>In</u>	
January----	57.3	35.5	46.4	76	11	107	4.31	2.29	5.96	8	.1
February---	61.1	37.4	49.2	80	17	108	4.54	2.53	6.17	7	.5
March-----	67.9	43.9	55.9	85	25	226	5.95	3.29	8.11	8	.0
April-----	77.4	51.8	64.6	90	33	438	4.26	1.83	6.22	6	.0
May-----	83.9	60.0	72.0	95	42	682	4.27	1.84	6.24	6	.0
June-----	89.4	67.4	78.4	99	53	852	4.39	2.51	5.92	7	.0
July-----	90.9	70.7	80.8	99	62	955	5.65	3.23	7.62	10	.0
August-----	90.7	70.3	80.5	98	61	946	4.06	2.09	5.67	7	.0
September--	85.9	65.6	75.7	97	49	771	3.67	1.81	5.18	6	.0
October----	76.9	53.1	65.0	91	32	465	2.17	.36	3.56	3	.0
November---	66.8	42.2	54.5	83	24	169	3.06	1.37	4.43	5	.0
December---	59.5	37.1	48.3	78	17	103	5.02	2.58	7.00	8	.0
Early:											
Average--	75.6	52.9	64.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	101	10	---	---	---	---	---	---
Total----	---	---	---	---	---	5,822	51.35	42.51	59.77	81	.6

¹A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).



Water Availability & Use

CHATTAHOOCHEE RIVER BASIN

Georgia Department of
Environmental F

HMWB LIBRARY

STATE-SPECIFIC DOCUMENTS

FROST ASSOCIATES

Attachment #4

P.O.Box 495, Essex, Connecticut 06426
(203) 767-7644 FAX (203) 767-1971

June 23, 1995

To: Environmental Protection Division
205 Butler St., Floyd Towers East, Suite 1154
Atlanta, GA 30334

Attn: James Ussery

Fr: Frost Associates
P.O. Box 495
Essex, Conn 06426

Tel: (203) 767-1254
Fax: (203) 767-7069

Sub: Gaslight Co of Georgia
Columbus, GA

ALABAMA PORTION

CERCLIS:

Job:

ite Longitude: 84-57-30 84.958344
site Latitude : 32-27-30 32.458328

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. CENTRACTS may have up to ten radii of any length. 1000 block groups, and 15000 block group sides.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from the Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, P.O. Box 495, Essex, Conn. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the products obtained by multiplying each X-coordinate by the difference between the adjacent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

$$\text{Area} = 1/2 \{ X_a(Y_e - Y_b) + X_b(Y_a - Y_c) + X_c(Y_b - Y_d) + X_d(Y_c - Y_e) + X_e(Y_d - Y_a) \}$$

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "paint" method and manual entry method over ride the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 population and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: $((\text{Drilled} + \text{Dug Wells}) / \text{Households}) * \text{Population}$

Gaslight Co of Georgia
Columbus, GA

ALABAMA PORTION

No.	City	Block Group ID	Blk Grp People	House Holds	Public Water	Drilled Wells	Dug Wells	Other
1	Phenix City	01113 0301	1 22	9	1	0	0	0
2	Phenix City	01113 0301	2 851	390	393	0	0	0
3	Phenix City	01113 0301	3 392	206	182	0	0	0
4	Phenix City	01113 0302	1 972	404	432	0	0	0
5	Phenix City	01113 0302	2 473	200	208	0	0	0
6	Phenix City	01113 0302	3 471	245	238	0	0	0
7	Phenix City	01113 0303	1 927	411	402	0	0	0
8	Phenix City	01113 0303	2 419	251	257	0	0	0
9	Phenix City	01113 0303	3 917	427	448	0	0	0
10	Phenix City	01113 0303	4 1000	467	449	0	0	0
11	Phenix City	01113 0304	1 961	384	350	0	11	0
12	Phenix City	01113 0304	2 568	247	258	0	0	0
13	Phenix City	01113 0304	3 321	191	192	0	0	0
14	Phenix City	01113 0305	1 930	470	493	0	0	0
15	Phenix City	01113 0306	1 1024	468	460	0	0	0
16	Phenix City	01113 0306	2 525	208	185	0	14	0
17	Phenix City	01113 0306	3 348	127	114	5	0	0
18	Phenix City	01113 0306	4 506	183	169	0	7	0
19	Phenix City	01113 0306	5 509	257	252	0	18	0
20	Phenix City	01113 0306	6 1745	612	591	0	0	0
21	Phenix City	01113 0307	1 359	168	152	0	0	0
22	Phenix City	01113 0307	2 356	166	167	0	0	0
23	Phenix City	01113 0307	3 906	417	438	0	0	0
24	Phenix City	01113 0307	4 675	320	323	0	0	0
25	Phenix City	01113 0307	5 1228	528	519	0	0	0
26	Phenix City	01113 0308	1 1034	403	432	0	6	0
27	Phenix City	01113 0308	3 2062	756	719	0	0	0
28	Phenix City	01113 0308	4 814	336	342	0	0	0
29	Phenix City	01113 0308	5 389	179	178	0	0	0
30	Phenix City	01113 0308	6 10	5	1	0	0	0
===	=====	=====	=====	=====	=====	=====	=====	
	Totals:		21714	9435	9345	5	56	0

City	Census Tract ID		Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Sources
Phenix City	01113 0301	1	22	9	1	0	0	0
Phenix City	01113 0301	2	851	390	393	0	0	0
Phenix City	01113 0301	3	392	206	182	0	0	0
Phenix City	01113 0302	1	972	404	432	0	0	0
Phenix City	01113 0302	2	473	200	208	0	0	0
Phenix City	01113 0302	3	471	245	238	0	0	0
Phenix City	01113 0303	1	927	411	402	0	0	0
Phenix City	01113 0303	2	419	251	257	0	0	0
Phenix City	01113 0303	3	917	427	448	0	0	0
Phenix City	01113 0303	4	1000	467	449	0	0	0
Phenix City	01113 0304	1	961	384	350	0	11	0
Phenix City	01113 0304	2	568	247	258	0	0	0
Phenix City	01113 0304	3	321	191	192	0	0	0
Phenix City	01113 0305	1	930	470	493	0	0	0
Phenix City	01113 0306	1	1024	468	460	0	0	0
Phenix City	01113 0306	2	525	208	185	0	14	0
Phenix City	01113 0306	3	348	127	114	5	0	0
Phenix City	01113 0306	4	506	183	169	0	7	0
Phenix City	01113 0306	5	509	257	252	0	18	0
Phenix City	01113 0306	6	1745	612	591	0	0	0
Phenix City	01113 0307	1	359	168	152	0	0	0
Phenix City	01113 0307	2	356	166	167	0	0	0
Phenix City	01113 0307	3	906	417	438	0	0	0
Phenix City	01113 0307	4	675	320	323	0	0	0
Phenix City	01113 0307	5	1228	528	519	0	0	0
Phenix City	01113 0308	1	1034	403	432	0	6	0
Phenix City	01113 0308	3	2062	756	719	0	0	0
Phenix City	01113 0308	4	814	336	342	0	0	0
Phenix City	01113 0308	5	389	179	178	0	0	0
Phenix City	01113 0308	6	10	5	1	0	0	0
Sub Totals:			21714	9435	9345	5	56	0

For Radius of 4 Mi., Circle Area = 50.265482

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Phenix City	01113 3011	0.120575	0.120575	100.00
2	Phenix City	01113 3012	0.098745	0.098745	100.00
3	Phenix City	01113 3013	0.075712	0.075712	100.00
4	Phenix City	01113 3021	0.084827	0.084827	100.00
5	Phenix City	01113 3022	0.098969	0.098969	100.00
6	Phenix City	01113 3023	0.159602	0.155810	97.62
7	Phenix City	01113 3031	0.211876	0.211876	100.00
8	Phenix City	01113 3032	0.099011	0.099011	100.00
9	Phenix City	01113 3033	0.265419	0.265419	100.00
10	Phenix City	01113 3034	0.421595	0.404230	95.88
11	Phenix City	01113 3041	1.289475	0.515833	40.00
12	Phenix City	01113 3042	0.321817	0.316334	98.30
13	Phenix City	01113 3043	0.403013	0.089466	22.20
14	Phenix City	01113 3051	1.667577	0.123563	7.41
15	Phenix City	01113 3061	1.073936	0.119840	11.16
16	Phenix City	01113 3062	2.698667	0.577335	21.39
17	Phenix City	01113 3063	0.967857	0.130523	13.49
18	Phenix City	01113 3064	0.805108	0.114113	14.17
19	Phenix City	01113 3065	0.873205	0.133057	15.24
20	Phenix City	01113 3066	1.239424	0.601099	48.50
21	Phenix City	01113 3071	0.236450	0.236450	100.00
22	Phenix City	01113 3072	0.295011	0.295011	100.00
23	Phenix City	01113 3073	0.507447	0.507447	100.00
24	Phenix City	01113 3074	0.301816	0.301816	100.00
25	Phenix City	01113 3075	0.600473	0.597244	99.46
26	Phenix City	01113 3081	0.963450	0.963450	100.00
27	Phenix City	01113 3083	0.773673	0.773673	100.00
28	Phenix City	01113 3084	0.198766	0.198766	100.00
29	Phenix City	01113 3085	0.196892	0.196892	100.00
30	Phenix City	01113 3086	5.546143	4.041736	72.87
Totals:			22.596531	12.448824	

For Radius of 3 Mi., Circle Area = 28.274334

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Phenix City	01113 3011	0.120575	0.120575	100.00
2	Phenix City	01113 3012	0.098745	0.087000	88.11
3	Phenix City	01113 3013	0.075712	0.019100	25.23
4	Phenix City	01113 3021	0.084827	0.084827	100.00
5	Phenix City	01113 3022	0.098969	0.030882	31.20
7	Phenix City	01113 3031	0.211876	0.153412	72.41
8	Phenix City	01113 3032	0.099011	0.099011	100.00
9	Phenix City	01113 3033	0.265419	0.031210	11.76
11	Phenix City	01113 3041	1.289475	0.000250	0.02
21	Phenix City	01113 3071	0.236450	0.236450	100.00
22	Phenix City	01113 3072	0.295011	0.239881	81.31
23	Phenix City	01113 3073	0.507447	0.103293	20.36
24	Phenix City	01113 3074	0.301816	0.029504	9.78

25	Phenix City	01113 3075	0.600473	0.000149	0.02
26	Phenix City	01113 3081	0.963450	0.940500	97.62
27	Phenix City	01113 3083	0.773673	0.182708	23.62
28	Phenix City	01113 3084	0.198766	0.028083	14.13
29	Phenix City	01113 3085	0.196892	0.065513	33.27
30	Phenix City	01113 3086	5.546143	2.646165	47.71
====			====	====	====
Totals:			11.964729	5.098512	

For Radius of 2 Mi., Circle Area = 12.566371

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
30	Phenix City	01113 3086	5.546143	0.654554	11.80
====			====	====	====
Totals:			5.546143	0.654554	

For Radius of 1 Mi., Circle Area = 3.141593

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
====			====	====	====
Totals:			0.000000	0.000000	

For Radius of .5 Mi., Circle Area = 0.785398

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
====			====	====	====
Totals:			0.000000	0.000000	

For Radius of .25 Mi., Circle Area = 0.196350

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
====			====	====	====
Totals:			0.000000	0.000000	

=====
Site Data
=====

Population: 16567.32
Households: 7208.14
Drilled Wells: 0.67
Dug Wells: 17.13
Other Water Sources: 0.00

=====
Partial (RING) data
=====

---- Within Ring: 4 Mile(s) and 3 Mile(s) ----

Population: 10734.12
Households: 4637.65
Drilled Wells: 0.67
Dug Wells: 11.27
Other Water Sources: 0.00

** Population On Private Wells: 27.65

---- Within Ring: 3 Mile(s) and 2 Mile(s) ----

Population: 5832.02
Households: 2569.90
Drilled Wells: 0.00
Dug Wells: 5.86
Other Water Sources: 0.00

** Population On Private Wells: 13.30

---- Within Ring: 2 Mile(s) and 1 Mile(s) ----

Population: 1.18
Households: 0.59
Drilled Wells: 0.00
Dug Wells: 0.00
Other Water Sources: 0.00

** Population On Private Wells: 0.00

---- Within Ring: 1 Mile(s) and .5 Mile(s) ----

Population: 0.00
Households: 0.00
Drilled Wells: 0.00
Dug Wells: 0.00
Other Water Sources: 0.00

** Population On Private Wells: Not Applicable

---- Within Ring: .5 Mile(s) and .25 Mile(s) ----

Population:	0.00
Households:	0.00
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: Not Applicable

---- Within Ring: .25 Mile(s) and 0 Mile(s) ----

Population:	0.00
Households:	0.00
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: Not Applicable

**COLUMBUS, GEORGIA MANUFACTURED GAS PLANT SITE
INVESTIGATION AND REMEDIATION REPORT**

PREPARED FOR:

**JOHN H. JOHNSON, JR., ESQUIRE
TROUTMAN, SANDERS, LOCKERMAN AND ASHMORE
ATLANTA, GEORGIA**

AS COUNCIL FOR:

**GEORGIA POWER COMPANY
ATLANTA, GEORGIA**

PREPARED BY:

**IT CORPORATION
KNOXVILLE, TENNESSEE**

AUGUST 9, 1991

FROST ASSOCIATES

Attachment #4

P.O.Box 495, Essex, Connecticut 06426
(203) 767-7644 FAX (203) 767-1971

June 23, 1995

To: Environmental Protection Division
205 Butler St., Floyd Towers East, Suite 1154
Atlanta, GA 30334

Attn: James Ussery

Fr: Frost Associates
P.O. Box 495
Essex, Conn 06426

Tel: (203) 767-1254
Fax: (203) 767-7069

Sub: Gaslight Co of Georgia
Columbus, GA

CERCLIS:

Job:

Site Longitude: 84-57-30 84.958344
Site Latitude : 32-27-30 32.458328

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. CENTRACTS may have up to ten radii of any length. 1000 block groups, and 15000 block group sides.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from the Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, P.O. Box 495, Essex, Conn. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the products obtained by multiplying each X-coordinate by the difference between the adjacent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

$$\text{Area} = 1/2\{X_a(Y_e - Y_b) + X_b(Y_a - Y_c) + X_c(Y_b - Y_d) + X_d(Y_c - Y_e) + X_e(Y_d - Y_a)\}$$

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "paint" method and manual entry method over ride the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 population and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: $((\text{Drilled} + \text{Dug Wells}) / \text{Households}) * \text{Population}$

Gaslight Co of Georgia
Columbus, GA

No.	City	Block Group ID	Blk Grp People	House Holds	Public Water	Drilled Wells	Dug Wells	Other
1	Columbus	13215 0001	1 343	348	355	0	0	0
2	Columbus	13215 0001	2 11	7	8	0	0	0
3	Columbus	13215 0002	1 1239	520	555	0	0	0
4	Columbus	13215 0002	2 1395	630	608	0	0	0
5	Columbus	13215 0003	1 251	109	105	0	0	0
6	Columbus	13215 0003	2 322	138	126	0	0	0
7	Columbus	13215 0003	3 448	202	197	0	0	0
8	Columbus	13215 0004	1 1372	529	557	0	0	0
9	Columbus	13215 0004	2 968	401	399	0	0	0
10	Columbus	13215 0004	3 840	356	330	0	0	0
11	Columbus	13215 0005	1 751	339	357	0	0	0
12	Columbus	13215 0005	2 414	206	202	0	0	0
13	Columbus	13215 0005	3 625	289	263	0	0	0
14	Columbus	13215 0006	1 415	197	192	0	0	0
15	Columbus	13215 0006	2 620	281	298	0	0	0
16	Columbus	13215 0008	1 491	246	231	0	0	0
17	Columbus	13215 0008	2 884	415	407	0	0	0
18	Columbus	13215 0008	3 644	370	386	0	0	0
19	Columbus	13215 0008	4 299	149	143	0	0	0
20	Columbus	13215 0009	1 1601	827	850	0	0	0
21	Columbus	13215 0009	2 439	219	208	0	0	0
22	Columbus	13215 0009	3 817	232	233	0	0	0
23	Columbus	13215 0010	1 1808	802	826	0	0	0
24	Columbus	13215 0010	2 889	391	371	7	0	0
25	Columbus	13215 0010	3 1273	516	505	0	0	0
26	Columbus	13215 0011	1 1104	443	441	0	0	0
27	Columbus	13215 0011	2 846	406	376	0	0	0
28	Columbus	13215 0011	3 790	372	404	0	0	0
29	Columbus	13215 0012	1 1166	654	648	0	0	0
30	Columbus	13215 0012	2 478	262	261	0	0	0
31	Columbus	13215 0012	3 1009	607	607	0	0	0
32	Columbus	13215 0012	4 788	534	538	0	0	0
33	Columbus	13215 0013	1 683	337	356	0	0	0
34	Columbus	13215 0013	2 476	310	294	0	0	0
35	Columbus	13215 0014	1 585	306	315	0	0	0
36	Columbus	13215 0014	2 219	110	130	0	0	0
37	Columbus	13215 0014	3 385	321	355	0	0	0
38	Columbus	13215 0014	4 1191	494	447	0	0	0
39	Columbus	13215 0015	1 582	281	270	0	0	0
40	Columbus	13215 0015	2 464	98	97	0	0	0
41	Columbus	13215 0015	3 39	15	16	0	0	0
42	Columbus	13215 0015	4 145	62	57	0	0	0
43	Columbus	13215 0016	1 1524	535	528	0	0	0
44	Columbus	13215 0016	2 347	182	183	0	0	0
45	Columbus	13215 0016	3 523	219	204	0	0	0
46	Columbus	13215 0016	4 503	212	199	0	0	0
47	Columbus	13215 0016	5 331	132	135	0	0	0
48	Columbus	13215 0016	6 242	95	126	0	0	0
49	Columbus	13215 0018	1 638	308	326	0	0	0
50	Columbus	13215 0018	2 544	281	269	0	0	0
51	Columbus	13215 0018	3 152	78	76	0	0	0
52	Columbus	13215 0018	4 225	118	126	0	0	0
53	Columbus	13215 0019	1 616	340	345	0	0	0
54	Columbus	13215 0019	2 540	374	357	0	0	0
55	Columbus	13215 0020	1 1989	743	732	0	0	0

Gaslight Co of Georgia
Columbus, GA

56	Columbus	13215 0020	2	1260	495	513	0	0	0
57	Columbus	13215 0021	1	1001	408	406	0	0	0
58	Columbus	13215 0021	2	1402	649	638	6	0	0
59	Columbus	13215 0022	1	1253	475	470	0	0	0
60	Columbus	13215 0022	2	881	357	359	0	0	0
61	Columbus	13215 0022	3	854	322	322	0	0	0
62	Columbus	13215 0022	4	663	269	272	0	0	0
63	Columbus	13215 0023	1	1761	878	913	0	0	0
64	Columbus	13215 0024	1	1810	794	786	0	0	0
65	Columbus	13215 0025	1	863	23	24	0	0	0
66	Columbus	13215 0025	2	206	116	107	0	0	0
67	Columbus	13215 0025	3	672	277	275	0	0	0
68	Columbus	13215 0025	4	207	106	108	0	0	0
69	Columbus	13215 0025	5	829	454	435	0	0	0
70	Columbus	13215 0025	9	0	0	0	0	0	0
71	Columbus	13215 0026	1	285	218	222	0	0	0
72	Columbus	13215 0026	2	360	239	282	0	0	0
73	Columbus	13215 0027	1	7	3	0	0	0	0
74	Columbus	13215 0027	2	44	30	30	0	0	0
75	Columbus	13215 0027	3	595	212	222	0	0	0
76	Columbus	13215 0027	4	329	147	133	0	0	0
77	Columbus	13215 0027	5	393	192	184	0	0	0
78	Columbus	13215 0027	6	274	120	103	0	0	0
79	Columbus	13215 0027	9	431	169	163	0	0	0
80	Columbus	13215 0028	1	325	171	168	0	0	0
81	Columbus	13215 0028	2	354	177	189	0	0	0
82	Columbus	13215 0028	3	1106	486	442	0	0	0
83	Columbus	13215 0028	4	183	104	111	0	0	0
84	Columbus	13215 0028	5	283	150	151	0	0	0
85	Columbus	13215 0028	6	271	117	104	0	0	0
86	Columbus	13215 0028	7	276	155	173	0	0	0
87	Columbus	13215 0028	8	251	142	155	0	0	0
88	Columbus	13215 0030	1	874	343	314	0	0	0
89	Columbus	13215 0030	2	666	274	286	0	0	0
90	Columbus	13215 0030	3	567	271	270	0	0	0
91	Columbus	13215 0030	4	749	360	378	0	0	0
92	Columbus	13215 0031	1	911	333	317	0	0	0
93	Columbus	13215 0031	2	666	263	234	0	0	0
94	Columbus	13215 0031	3	604	250	235	0	0	0
95	Columbus	13215 0031	4	782	285	258	0	0	0
96	Columbus	13215 0031	5	748	271	314	0	0	0
97	Columbus	13215 0031	9	1748	755	799	0	0	0
98	Columbus	13215 0032	1	837	452	452	0	0	0
99	Columbus	13215 0032	2	1093	487	485	0	0	0
100	Columbus	13215 0032	3	1101	409	383	0	0	0
101	Columbus	13215 0032	4	365	146	180	0	0	0
102	Columbus	13215 0032	5	620	292	286	0	0	0
103	Columbus	13215 0032	9	0	0	0	0	0	0
104	Columbus	13215 0033	1	1759	731	765	0	0	0
105	Columbus	13215 0033	2	615	242	248	0	0	0
106	Columbus	13215 0033	3	604	256	254	0	0	0
107	Columbus	13215 0033	4	761	265	243	0	0	0
108	Columbus	13215 0033	5	849	349	363	0	0	0
109	Columbus	13215 0033	6	356	251	221	0	0	0
110	Columbus	13215 0034	1	787	423	449	0	0	0
111	Columbus	13215 0034	2	481	252	257	0	0	0
112	Columbus	13215 0034	3	1369	634	621	0	0	0
113	Columbus	13215 0034	4	350	124	106	0	0	0
114	Columbus	13215 0105	1	3905	1590	1537	5	0	13
115	Columbus	13215 0105	2	1191	428	411	0	0	0
116	Columbus	13215 0105	3	1603	631	650	0	0	0

Gaslight Co of Georgia
Columbus, GA

117	Columbus	13215 0105 4	1309	642	675	0	0	0
118	Columbus	13215 0108 9	11975	2213	2207	9	0	0
119	Columbus	13215 0109 1	460	169	163	0	0	0
120	Columbus	13215 0109 9	445	232	244	3	0	0
121	Columbus	13215 0110 1	597	245	233	0	0	0
122	Columbus	13215 0029011	1051	406	412	0	0	0
123	Columbus	13215 0029012	2640	1136	1126	4	0	0
124	Columbus	13215 0029021	4424	1931	1931	0	0	0
125	Columbus	13215 0104022	932	417	415	0	0	0
126	Columbus	13215 0104029	352	150	182	0	0	0
127	Columbus	13215 0106021	2178	735	747	0	0	0
128	Columbus	13215 0106022	3304	1173	1161	0	0	0
129	Columbus	13215 0106042	3172	1087	1112	0	0	0
130	Columbus	13215 0106043	4600	1537	1502	0	0	10
131	Columbus	13215 0106051	3187	996	997	0	0	0
132	Columbus	13215 0107011	3066	1042	1019	0	0	0
133	Columbus	13215 0107012	1999	851	874	0	0	0
134	Columbus	13215 0107021	3039	1021	1028	0	0	7
135	Columbus	13215 0107022	2345	798	784	0	0	0
136	Columbus	13215 0107031	5251	2061	2117	0	0	0
137	Columbus	13215 0107032	1222	474	418	0	0	0
===	=====	=====	=====	=====	=====	=====	=====	
	Totals:		142221	57086	57053	34	0	30

Gaslight Co of Georgia
Columbus, GA

City	Census Tract ID		Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Sources
Columbus	13215 0001	1	343	348	355	0	0	0
Columbus	13215 0001	2	11	7	8	0	0	0
Columbus	13215 0002	1	1239	520	555	0	0	0
Columbus	13215 0002	2	1395	630	608	0	0	0
Columbus	13215 0003	1	251	109	105	0	0	0
Columbus	13215 0003	2	322	138	126	0	0	0
Columbus	13215 0003	3	448	202	197	0	0	0
Columbus	13215 0004	1	1372	529	557	0	0	0
Columbus	13215 0004	2	968	401	399	0	0	0
Columbus	13215 0004	3	840	356	330	0	0	0
Columbus	13215 0005	1	751	339	357	0	0	0
Columbus	13215 0005	2	414	206	202	0	0	0
Columbus	13215 0005	3	625	289	263	0	0	0
Columbus	13215 0006	1	415	197	192	0	0	0
Columbus	13215 0006	2	620	281	298	0	0	0
Columbus	13215 0008	1	491	246	231	0	0	0
Columbus	13215 0008	2	884	415	407	0	0	0
Columbus	13215 0008	3	644	370	386	0	0	0
Columbus	13215 0008	4	299	149	143	0	0	0
Columbus	13215 0009	1	1601	827	850	0	0	0
Columbus	13215 0009	2	439	219	208	0	0	0
Columbus	13215 0009	3	817	232	233	0	0	0
Columbus	13215 0010	1	1808	802	826	0	0	0
Columbus	13215 0010	2	889	391	371	7	0	0
Columbus	13215 0010	3	1273	516	505	0	0	0
Columbus	13215 0011	1	1104	443	441	0	0	0
Columbus	13215 0011	2	846	406	376	0	0	0
Columbus	13215 0011	3	790	372	404	0	0	0
Columbus	13215 0012	1	1166	654	648	0	0	0
Columbus	13215 0012	2	478	262	261	0	0	0
Columbus	13215 0012	3	1009	607	607	0	0	0
Columbus	13215 0012	4	788	534	538	0	0	0
Columbus	13215 0013	1	683	337	356	0	0	0
Columbus	13215 0013	2	476	310	294	0	0	0
Columbus	13215 0014	1	585	306	315	0	0	0
Columbus	13215 0014	2	219	110	130	0	0	0
Columbus	13215 0014	3	385	321	355	0	0	0
Columbus	13215 0014	4	1191	494	447	0	0	0
Columbus	13215 0015	1	582	281	270	0	0	0
Columbus	13215 0015	2	464	98	97	0	0	0
Columbus	13215 0015	3	39	15	16	0	0	0
Columbus	13215 0015	4	145	62	57	0	0	0
Columbus	13215 0016	1	1524	535	528	0	0	0
Columbus	13215 0016	2	347	182	183	0	0	0
Columbus	13215 0016	3	523	219	204	0	0	0
Columbus	13215 0016	4	503	212	199	0	0	0
Columbus	13215 0016	5	331	132	135	0	0	0
Columbus	13215 0016	6	242	95	126	0	0	0
Columbus	13215 0018	1	638	308	326	0	0	0
Columbus	13215 0018	2	544	281	269	0	0	0
Columbus	13215 0018	3	152	78	76	0	0	0
Columbus	13215 0018	4	225	118	126	0	0	0
Columbus	13215 0019	1	616	340	345	0	0	0
Columbus	13215 0019	2	540	374	357	0	0	0
Columbus	13215 0020	1	1989	743	732	0	0	0
Columbus	13215 0020	2	1260	495	513	0	0	0

Gaslight Co of Georgia
Columbus, GA

Columbus	13215	0021	1	1001	408	406	0	0	0
Columbus	13215	0021	2	1402	649	638	6	0	0
Columbus	13215	0022	1	1253	475	470	0	0	0
Columbus	13215	0022	2	881	357	359	0	0	0
Columbus	13215	0022	3	854	322	322	0	0	0
Columbus	13215	0022	4	663	269	272	0	0	0
Columbus	13215	0023	1	1761	878	913	0	0	0
Columbus	13215	0024	1	1810	794	786	0	0	0
Columbus	13215	0025	1	863	23	24	0	0	0
Columbus	13215	0025	2	206	116	107	0	0	0
Columbus	13215	0025	3	672	277	275	0	0	0
Columbus	13215	0025	4	207	106	108	0	0	0
Columbus	13215	0025	5	829	454	435	0	0	0
Columbus	13215	0025	9	0	0	0	0	0	0
Columbus	13215	0026	1	285	218	222	0	0	0
Columbus	13215	0026	2	360	239	282	0	0	0
Columbus	13215	0027	1	7	3	0	0	0	0
Columbus	13215	0027	2	44	30	30	0	0	0
Columbus	13215	0027	3	595	212	222	0	0	0
Columbus	13215	0027	4	329	147	133	0	0	0
Columbus	13215	0027	5	393	192	184	0	0	0
Columbus	13215	0027	6	274	120	103	0	0	0
Columbus	13215	0027	9	431	169	163	0	0	0
Columbus	13215	0028	1	325	171	168	0	0	0
Columbus	13215	0028	2	354	177	189	0	0	0
Columbus	13215	0028	3	1106	486	442	0	0	0
Columbus	13215	0028	4	183	104	111	0	0	0
Columbus	13215	0028	5	283	150	151	0	0	0
Columbus	13215	0028	6	271	117	104	0	0	0
Columbus	13215	0028	7	276	155	173	0	0	0
Columbus	13215	0028	8	251	142	155	0	0	0
Columbus	13215	0030	1	874	343	314	0	0	0
Columbus	13215	0030	2	666	274	286	0	0	0
Columbus	13215	0030	3	567	271	270	0	0	0
Columbus	13215	0030	4	749	360	378	0	0	0
Columbus	13215	0031	1	911	333	317	0	0	0
Columbus	13215	0031	2	666	263	234	0	0	0
Columbus	13215	0031	3	604	250	235	0	0	0
Columbus	13215	0031	4	782	285	258	0	0	0
Columbus	13215	0031	5	748	271	314	0	0	0
Columbus	13215	0031	9	1748	755	799	0	0	0
Columbus	13215	0032	1	837	452	452	0	0	0
Columbus	13215	0032	2	1093	487	485	0	0	0
Columbus	13215	0032	3	1101	409	383	0	0	0
Columbus	13215	0032	4	365	146	180	0	0	0
Columbus	13215	0032	5	620	292	286	0	0	0
Columbus	13215	0032	9	0	0	0	0	0	0
Columbus	13215	0033	1	1759	731	765	0	0	0
Columbus	13215	0033	2	615	242	248	0	0	0
Columbus	13215	0033	3	604	256	254	0	0	0
Columbus	13215	0033	4	761	265	243	0	0	0
Columbus	13215	0033	5	849	349	363	0	0	0
Columbus	13215	0033	6	356	251	221	0	0	0
Columbus	13215	0034	1	787	423	449	0	0	0
Columbus	13215	0034	2	481	252	257	0	0	0
Columbus	13215	0034	3	1369	634	621	0	0	0
Columbus	13215	0034	4	350	124	106	0	0	0
Columbus	13215	0105	1	3905	1590	1537	5	0	13
Columbus	13215	0105	2	1191	428	411	0	0	0
Columbus	13215	0105	3	1603	631	650	0	0	0
Columbus	13215	0105	4	1309	642	675	0	0	0

Gaslight Co of Georgia
Columbus, GA

Columbus	13215	0108	9	11975	2213	2207	9	0	0
Columbus	13215	0109	1	460	169	163	0	0	0
Columbus	13215	0109	9	445	232	244	3	0	0
Columbus	13215	0110	1	597	245	233	0	0	0
Columbus	13215	0029011		1051	406	412	0	0	0
Columbus	13215	0029012		2640	1136	1126	4	0	0
Columbus	13215	0029021		4424	1931	1931	0	0	0
Columbus	13215	0104022		932	417	415	0	0	0
Columbus	13215	0104029		352	150	182	0	0	0
Columbus	13215	0106021		2178	735	747	0	0	0
Columbus	13215	0106022		3304	1173	1161	0	0	0
Columbus	13215	0106042		3172	1087	1112	0	0	0
Columbus	13215	0106043		4600	1537	1502	0	0	10
Columbus	13215	0106051		3187	996	997	0	0	0
Columbus	13215	0107011		3066	1042	1019	0	0	0
Columbus	13215	0107012		1999	851	874	0	0	0
Columbus	13215	0107021		3039	1021	1028	0	0	7
Columbus	13215	0107022		2345	798	784	0	0	0
Columbus	13215	0107031		5251	2061	2117	0	0	0
Columbus	13215	0107032		1222	474	418	0	0	0
Sub Totals:				142221	57086	57053	34	0	30

Gaslight Co of Georgia
Columbus, GA

For Radius of 4 Mi., Circle Area = 50.265482

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Columbus	13215 11	0.261405	0.261405	100.00
2	Columbus	13215 12	0.293546	0.293546	100.00
3	Columbus	13215 21	0.751151	0.318862	42.45
4	Columbus	13215 22	0.396915	0.396915	100.00
5	Columbus	13215 31	0.064441	0.056858	88.23
6	Columbus	13215 32	0.095839	0.095839	100.00
7	Columbus	13215 33	0.174544	0.173420	99.36
8	Columbus	13215 41	0.755694	0.007037	0.93
9	Columbus	13215 42	0.284639	0.244012	85.73
10	Columbus	13215 43	1.047190	0.233064	22.26
11	Columbus	13215 51	0.146998	0.146998	100.00
12	Columbus	13215 52	0.071281	0.071281	100.00
13	Columbus	13215 53	0.177029	0.177029	100.00
14	Columbus	13215 61	0.121338	0.121338	100.00
15	Columbus	13215 62	0.172899	0.172899	100.00
16	Columbus	13215 81	0.152639	0.152639	100.00
17	Columbus	13215 82	0.202051	0.202051	100.00
18	Columbus	13215 83	0.144407	0.144407	100.00
19	Columbus	13215 84	0.093129	0.093129	100.00
20	Columbus	13215 91	0.413272	0.413272	100.00
21	Columbus	13215 92	0.106086	0.106086	100.00
22	Columbus	13215 93	0.149280	0.149280	100.00
23	Columbus	13215 101	0.949082	0.949082	100.00
24	Columbus	13215 102	0.328223	0.328223	100.00
25	Columbus	13215 103	0.538053	0.538053	100.00
26	Columbus	13215 111	0.524404	0.524404	100.00
27	Columbus	13215 112	0.387384	0.387384	100.00
28	Columbus	13215 113	0.345280	0.345280	100.00
29	Columbus	13215 121	0.433181	0.433181	100.00
30	Columbus	13215 122	0.217682	0.217682	100.00
31	Columbus	13215 123	0.268903	0.268903	100.00
32	Columbus	13215 124	0.211348	0.211348	100.00
33	Columbus	13215 131	0.080885	0.080885	100.00
34	Columbus	13215 132	0.096091	0.096091	100.00
35	Columbus	13215 141	0.083060	0.083060	100.00
36	Columbus	13215 142	0.065481	0.065481	100.00
37	Columbus	13215 143	0.065475	0.065475	100.00
38	Columbus	13215 144	0.097789	0.097789	100.00
39	Columbus	13215 151	0.127069	0.127069	100.00
40	Columbus	13215 152	0.131245	0.131245	100.00
41	Columbus	13215 153	0.077140	0.077140	100.00
42	Columbus	13215 154	0.352089	0.352089	100.00
43	Columbus	13215 161	0.098055	0.098055	100.00
44	Columbus	13215 162	0.070625	0.070625	100.00
45	Columbus	13215 163	0.110136	0.110136	100.00
46	Columbus	13215 164	0.292183	0.292183	100.00
47	Columbus	13215 165	0.078006	0.078006	100.00
48	Columbus	13215 166	0.173036	0.173036	100.00
49	Columbus	13215 181	0.094091	0.094091	100.00
50	Columbus	13215 182	0.108160	0.108160	100.00
51	Columbus	13215 183	0.162847	0.162847	100.00
52	Columbus	13215 184	0.062203	0.062203	100.00
53	Columbus	13215 191	0.204874	0.204874	100.00

Gaslight Co of Georgia
Columbus, GA

54	Columbus	13215 192	0.128486	0.128486	100.00
55	Columbus	13215 201	0.455282	0.455282	100.00
56	Columbus	13215 202	0.372001	0.372001	100.00
57	Columbus	13215 211	0.303180	0.303180	100.00
58	Columbus	13215 212	0.838872	0.838872	100.00
59	Columbus	13215 221	0.228815	0.228815	100.00
60	Columbus	13215 222	0.115715	0.115715	100.00
61	Columbus	13215 223	0.142363	0.142363	100.00
62	Columbus	13215 107032	0.240856	0.240856	100.00
63	Columbus	13215 231	0.441906	0.441906	100.00
64	Columbus	13215 241	0.369302	0.369302	100.00
65	Columbus	13215 251	0.062805	0.062805	100.00
66	Columbus	13215 252	0.080956	0.080956	100.00
67	Columbus	13215 253	0.183550	0.183550	100.00
68	Columbus	13215 254	0.073719	0.073719	100.00
69	Columbus	13215 255	0.081804	0.081804	100.00
70	Columbus	13215 259	0.637179	0.637179	100.00
71	Columbus	13215 261	0.105734	0.105734	100.00
72	Columbus	13215 262	0.127640	0.127640	100.00
73	Columbus	13215 271	0.125388	0.125388	100.00
74	Columbus	13215 272	0.086754	0.086754	100.00
75	Columbus	13215 273	0.079621	0.079621	100.00
76	Columbus	13215 274	0.095685	0.095685	100.00
77	Columbus	13215 275	0.075355	0.075355	100.00
78	Columbus	13215 276	0.142474	0.142474	100.00
79	Columbus	13215 279	0.814104	0.814104	100.00
80	Columbus	13215 281	0.047185	0.047185	100.00
81	Columbus	13215 282	0.039294	0.039294	100.00
82	Columbus	13215 283	0.162524	0.162524	100.00
83	Columbus	13215 284	0.229094	0.229094	100.00
84	Columbus	13215 285	0.048271	0.048271	100.00
85	Columbus	13215 286	0.058897	0.058897	100.00
86	Columbus	13215 287	0.029396	0.029396	100.00
87	Columbus	13215 288	0.030893	0.030893	100.00
88	Columbus	13215 301	0.207094	0.207094	100.00
89	Columbus	13215 302	0.265322	0.265322	100.00
90	Columbus	13215 303	0.108821	0.108821	100.00
91	Columbus	13215 304	0.109415	0.109415	100.00
92	Columbus	13215 311	0.183159	0.183159	100.00
93	Columbus	13215 312	0.152669	0.152669	100.00
94	Columbus	13215 313	0.106127	0.106127	100.00
95	Columbus	13215 314	0.133604	0.133604	100.00
96	Columbus	13215 315	0.136799	0.136799	100.00
97	Columbus	13215 319	1.325888	1.325888	100.00
98	Columbus	13215 321	0.205505	0.205505	100.00
99	Columbus	13215 322	0.111673	0.111673	100.00
100	Columbus	13215 323	0.141362	0.141362	100.00
101	Columbus	13215 324	0.144495	0.144495	100.00
102	Columbus	13215 325	0.098557	0.098557	100.00
103	Columbus	13215 329	0.050812	0.050812	100.00
104	Columbus	13215 331	0.631351	0.604568	95.76
105	Columbus	13215 332	0.141495	0.141495	100.00
106	Columbus	13215 333	0.161383	0.161383	100.00
107	Columbus	13215 334	0.210130	0.210130	100.00
108	Columbus	13215 335	0.148158	0.148158	100.00
109	Columbus	13215 336	0.167205	0.167205	100.00
110	Columbus	13215 341	0.268747	0.268747	100.00
111	Columbus	13215 342	0.103082	0.103082	100.00
112	Columbus	13215 343	0.204854	0.204854	100.00
113	Columbus	13215 344	0.061071	0.061071	100.00
114	Columbus	13215 1051	3.194540	0.175902	5.51

Gaslight Co of Georgia
Columbus, GA

115	Columbus	13215 1052	0.817577	0.420591	51.44
116	Columbus	13215 1053	0.583237	0.576031	98.76
117	Columbus	13215 1054	0.827771	0.138534	16.74
118	Columbus	13215 1089	76.344414	1.612475	2.11
119	Columbus	13215 1091	0.058910	0.058910	100.00
120	Columbus	13215 1099	3.373950	0.740408	21.94
121	Columbus	13215 1101	0.151823	0.151823	100.00
122	Columbus	13215 29011	0.425414	0.425414	100.00
123	Columbus	13215 29012	0.499189	0.499189	100.00
124	Columbus	13215 29021	1.216311	1.216311	100.00
125	Columbus	13215 104022	0.578224	0.060302	10.43
126	Columbus	13215 104029	1.522388	0.514999	33.83
127	Columbus	13215 106021	0.449203	0.449203	100.00
128	Columbus	13215 106022	1.005502	1.005502	100.00
129	Columbus	13215 106042	0.732490	0.722635	98.65
130	Columbus	13215 106043	2.230170	0.159711	7.16
131	Columbus	13215 106051	2.232708	0.275728	12.35
132	Columbus	13215 107011	1.858357	1.142583	61.48
133	Columbus	13215 107012	0.519293	0.519293	100.00
134	Columbus	13215 107021	1.307773	1.235438	94.47
135	Columbus	13215 107022	0.537333	0.537333	100.00
136	Columbus	13215 107031	1.814397	1.593671	87.83
137	Columbus	13215 224	0.112283	0.112283	100.00
===	=====	=====	=====	=====	=====
Totals:			127.936989	37.816803	

For Radius of 3 Mi., Circle Area = 28.274334

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Columbus	13215 11	0.261405	0.261405	100.00
2	Columbus	13215 12	0.293546	0.293546	100.00
11	Columbus	13215 51	0.146998	0.019209	13.07
14	Columbus	13215 61	0.121338	0.001037	0.85
15	Columbus	13215 62	0.172899	0.045890	26.54
16	Columbus	13215 81	0.152639	0.070882	46.44
17	Columbus	13215 82	0.202051	0.201480	99.72
18	Columbus	13215 83	0.144407	0.144407	100.00
20	Columbus	13215 91	0.413272	0.184517	44.65
21	Columbus	13215 92	0.106086	0.057649	54.34
22	Columbus	13215 93	0.149280	0.149280	100.00
23	Columbus	13215 101	0.949082	0.118141	12.45
24	Columbus	13215 102	0.328223	0.328223	100.00
25	Columbus	13215 103	0.538053	0.271170	50.40
26	Columbus	13215 111	0.524404	0.518167	98.81
27	Columbus	13215 112	0.387384	0.387384	100.00
28	Columbus	13215 113	0.345280	0.345280	100.00
29	Columbus	13215 121	0.433181	0.433181	100.00
30	Columbus	13215 122	0.217682	0.217682	100.00
31	Columbus	13215 123	0.268903	0.268903	100.00
32	Columbus	13215 124	0.211348	0.211348	100.00
33	Columbus	13215 131	0.080885	0.080885	100.00
34	Columbus	13215 132	0.096091	0.096091	100.00
35	Columbus	13215 141	0.083060	0.083060	100.00
36	Columbus	13215 142	0.065481	0.065481	100.00
37	Columbus	13215 143	0.065475	0.065475	100.00
38	Columbus	13215 144	0.097789	0.097789	100.00
39	Columbus	13215 151	0.127069	0.127069	100.00

Gaslight Co of Georgia
Columbus, GA

40	Columbus	13215 152	0.131245	0.131245	100.00
41	Columbus	13215 153	0.077140	0.077140	100.00
42	Columbus	13215 154	0.352089	0.352089	100.00
43	Columbus	13215 161	0.098055	0.095382	97.27
44	Columbus	13215 162	0.070625	0.070625	100.00
45	Columbus	13215 163	0.110136	0.068039	61.78
46	Columbus	13215 164	0.292183	0.148015	50.66
47	Columbus	13215 165	0.078006	0.078006	100.00
48	Columbus	13215 166	0.173036	0.173036	100.00
49	Columbus	13215 181	0.094091	0.094091	100.00
50	Columbus	13215 182	0.108160	0.108160	100.00
51	Columbus	13215 183	0.162847	0.162847	100.00
52	Columbus	13215 184	0.062203	0.062203	100.00
53	Columbus	13215 191	0.204874	0.204874	100.00
54	Columbus	13215 192	0.128486	0.128486	100.00
55	Columbus	13215 201	0.455282	0.455282	100.00
56	Columbus	13215 202	0.372001	0.372001	100.00
57	Columbus	13215 211	0.303180	0.160875	53.06
58	Columbus	13215 212	0.838872	0.835935	99.65
59	Columbus	13215 221	0.228815	0.228815	100.00
60	Columbus	13215 222	0.115715	0.115715	100.00
61	Columbus	13215 223	0.142363	0.142363	100.00
62	Columbus	13215 107032	0.240856	0.093872	38.97
63	Columbus	13215 231	0.441906	0.441906	100.00
64	Columbus	13215 241	0.369302	0.369302	100.00
65	Columbus	13215 251	0.062805	0.062805	100.00
66	Columbus	13215 252	0.080956	0.080956	100.00
67	Columbus	13215 253	0.183550	0.183550	100.00
68	Columbus	13215 254	0.073719	0.073719	100.00
69	Columbus	13215 255	0.081804	0.081804	100.00
70	Columbus	13215 259	0.637179	0.637179	100.00
71	Columbus	13215 261	0.105734	0.105734	100.00
72	Columbus	13215 262	0.127640	0.127640	100.00
73	Columbus	13215 271	0.125388	0.125388	100.00
74	Columbus	13215 272	0.086754	0.086754	100.00
75	Columbus	13215 273	0.079621	0.079621	100.00
76	Columbus	13215 274	0.095685	0.095685	100.00
77	Columbus	13215 275	0.075355	0.075355	100.00
78	Columbus	13215 276	0.142474	0.142474	100.00
79	Columbus	13215 279	0.814104	0.814104	100.00
80	Columbus	13215 281	0.047185	0.047185	100.00
81	Columbus	13215 282	0.039294	0.039294	100.00
82	Columbus	13215 283	0.162524	0.162524	100.00
83	Columbus	13215 284	0.229094	0.229094	100.00
84	Columbus	13215 285	0.048271	0.048271	100.00
85	Columbus	13215 286	0.058897	0.058897	100.00
86	Columbus	13215 287	0.029396	0.029396	100.00
87	Columbus	13215 288	0.030893	0.030893	100.00
88	Columbus	13215 301	0.207094	0.207094	100.00
89	Columbus	13215 302	0.265322	0.265322	100.00
90	Columbus	13215 303	0.108821	0.108821	100.00
91	Columbus	13215 304	0.109415	0.109415	100.00
92	Columbus	13215 311	0.183159	0.183159	100.00
93	Columbus	13215 312	0.152669	0.101369	66.40
97	Columbus	13215 319	1.325888	0.980994	73.99
98	Columbus	13215 321	0.205505	0.205505	100.00
99	Columbus	13215 322	0.111673	0.111673	100.00
100	Columbus	13215 323	0.141362	0.141362	100.00
101	Columbus	13215 324	0.144495	0.144495	100.00
102	Columbus	13215 325	0.098557	0.098557	100.00
103	Columbus	13215 329	0.050812	0.050812	100.00

Gaslight Co of Georgia
Columbus, GA

104	Columbus	13215 331	0.631351	0.220381	34.91
107	Columbus	13215 334	0.210130	0.103951	49.47
108	Columbus	13215 335	0.148158	0.148158	100.00
109	Columbus	13215 336	0.167205	0.095022	56.83
110	Columbus	13215 341	0.268747	0.162863	60.60
112	Columbus	13215 343	0.204854	0.023414	11.43
115	Columbus	13215 1052	0.817577	0.007617	0.93
116	Columbus	13215 1053	0.583237	0.070602	12.11
122	Columbus	13215 29011	0.425414	0.425414	100.00
123	Columbus	13215 29012	0.499189	0.499189	100.00
124	Columbus	13215 29021	1.216311	1.216311	100.00
127	Columbus	13215 106021	0.449203	0.025983	5.78
128	Columbus	13215 106022	1.005502	0.914160	90.92
129	Columbus	13215 106042	0.732490	0.050806	6.94
132	Columbus	13215 107011	1.858357	0.399978	21.52
133	Columbus	13215 107012	0.519293	0.519293	100.00
134	Columbus	13215 107021	1.307773	0.399316	30.53
135	Columbus	13215 107022	0.537333	0.537333	100.00
136	Columbus	13215 107031	1.814397	0.680346	37.50
137	Columbus	13215 224	0.112283	0.112283	100.00
===	=====	=====	=====	=====	=====
Totals:			32.666672	23.054253	

For Radius of 2 Mi., Circle Area = 12.566371

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Columbus	13215 11	0.261405	0.206520	79.00
2	Columbus	13215 12	0.293546	0.025484	8.68
24	Columbus	13215 102	0.328223	0.001015	0.31
26	Columbus	13215 111	0.524404	0.144791	27.61
27	Columbus	13215 112	0.387384	0.337501	87.12
28	Columbus	13215 113	0.345280	0.077005	22.30
29	Columbus	13215 121	0.433181	0.129879	29.98
30	Columbus	13215 122	0.217682	0.217682	100.00
31	Columbus	13215 123	0.268903	0.268903	100.00
32	Columbus	13215 124	0.211348	0.211348	100.00
33	Columbus	13215 131	0.080885	0.016927	20.93
34	Columbus	13215 132	0.096091	0.047481	49.41
40	Columbus	13215 152	0.131245	0.003488	2.66
41	Columbus	13215 153	0.077140	0.024133	31.28
42	Columbus	13215 154	0.352089	0.302030	85.78
49	Columbus	13215 181	0.094091	0.085779	91.17
50	Columbus	13215 182	0.108160	0.108160	100.00
51	Columbus	13215 183	0.162847	0.162847	100.00
52	Columbus	13215 184	0.062203	0.061792	99.34
53	Columbus	13215 191	0.204874	0.204874	100.00
54	Columbus	13215 192	0.128486	0.128486	100.00
55	Columbus	13215 201	0.455282	0.455282	100.00
56	Columbus	13215 202	0.372001	0.372001	100.00
57	Columbus	13215 211	0.303180	0.002569	0.85
58	Columbus	13215 212	0.838872	0.195816	23.34
59	Columbus	13215 221	0.228815	0.228815	100.00
60	Columbus	13215 222	0.115715	0.115715	100.00
61	Columbus	13215 223	0.142363	0.142363	100.00
63	Columbus	13215 231	0.441906	0.441906	100.00
64	Columbus	13215 241	0.369302	0.369302	100.00
65	Columbus	13215 251	0.062805	0.062805	100.00

Gaslight Co of Georgia
Columbus, GA

66	Columbus	13215 252	0.080956	0.080956	100.00
67	Columbus	13215 253	0.183550	0.183550	100.00
68	Columbus	13215 254	0.073719	0.073719	100.00
69	Columbus	13215 255	0.081804	0.081804	100.00
70	Columbus	13215 259	0.637179	0.624679	98.04
71	Columbus	13215 261	0.105734	0.059336	56.12
72	Columbus	13215 262	0.127640	0.031623	24.78
73	Columbus	13215 271	0.125388	0.125388	100.00
74	Columbus	13215 272	0.086754	0.086754	100.00
75	Columbus	13215 273	0.079621	0.079621	100.00
76	Columbus	13215 274	0.095685	0.095685	100.00
77	Columbus	13215 275	0.075355	0.075355	100.00
78	Columbus	13215 276	0.142474	0.142474	100.00
79	Columbus	13215 279	0.814104	0.814104	100.00
80	Columbus	13215 281	0.047185	0.047185	100.00
81	Columbus	13215 282	0.039294	0.039294	100.00
82	Columbus	13215 283	0.162524	0.162524	100.00
83	Columbus	13215 284	0.229094	0.229094	100.00
84	Columbus	13215 285	0.048271	0.048271	100.00
85	Columbus	13215 286	0.058897	0.058897	100.00
86	Columbus	13215 287	0.029396	0.029396	100.00
87	Columbus	13215 288	0.030893	0.030893	100.00
88	Columbus	13215 301	0.207094	0.207094	100.00
89	Columbus	13215 302	0.265322	0.264762	99.79
90	Columbus	13215 303	0.108821	0.108821	100.00
91	Columbus	13215 304	0.109415	0.109415	100.00
97	Columbus	13215 319	1.325888	0.308695	23.28
98	Columbus	13215 321	0.205505	0.082410	40.10
99	Columbus	13215 322	0.111673	0.024598	22.03
101	Columbus	13215 324	0.144495	0.074171	51.33
102	Columbus	13215 325	0.098557	0.074812	75.91
122	Columbus	13215 29011	0.425414	0.425414	100.00
123	Columbus	13215 29012	0.499189	0.498363	99.83
124	Columbus	13215 29021	1.216311	0.844060	69.40
128	Columbus	13215 106022	1.005502	0.168515	16.76
133	Columbus	13215 107012	0.519293	0.143662	27.66
135	Columbus	13215 107022	0.537333	0.118094	21.98
137	Columbus	13215 224	0.112283	0.112283	100.00
===	=====	=====	=====	=====	=====
Totals:			18.347319	11.918468	

For Radius of 1 Mi., Circle Area = 3.141593

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
27	Columbus	13215 112	0.387384	0.000931	0.24
31	Columbus	13215 123	0.268903	0.042833	15.93
32	Columbus	13215 124	0.211348	0.149547	70.76
56	Columbus	13215 202	0.372001	0.093493	25.13
59	Columbus	13215 221	0.228815	0.126918	55.47
60	Columbus	13215 222	0.115715	0.115715	100.00
61	Columbus	13215 223	0.142363	0.142363	100.00
63	Columbus	13215 231	0.441906	0.436841	98.85
64	Columbus	13215 241	0.369302	0.220298	59.65
73	Columbus	13215 271	0.125388	0.043503	34.69
74	Columbus	13215 272	0.086754	0.086632	99.86
75	Columbus	13215 273	0.079621	0.079621	100.00
76	Columbus	13215 274	0.095685	0.095685	100.00

Gaslight Co of Georgia
Columbus, GA

77	Columbus	13215 275	0.075355	0.074359	98.68
79	Columbus	13215 279	0.814104	0.238773	29.33
80	Columbus	13215 281	0.047185	0.047185	100.00
81	Columbus	13215 282	0.039294	0.039294	100.00
82	Columbus	13215 283	0.162524	0.162524	100.00
83	Columbus	13215 284	0.229094	0.229094	100.00
84	Columbus	13215 285	0.048271	0.048271	100.00
85	Columbus	13215 286	0.058897	0.058897	100.00
86	Columbus	13215 287	0.029396	0.029396	100.00
87	Columbus	13215 288	0.030893	0.030893	100.00
88	Columbus	13215 301	0.207094	0.067342	32.52
90	Columbus	13215 303	0.108821	0.096110	88.32
91	Columbus	13215 304	0.109415	0.109415	100.00
122	Columbus	13215 29011	0.425414	0.054737	12.87
123	Columbus	13215 29012	0.499189	0.000292	0.06
124	Columbus	13215 29021	1.216311	0.110405	9.08
137	Columbus	13215 224	0.112283	0.112283	100.00
===	=====	=====	=====	=====	=====
Totals:			7.138722	3.143651	

For Radius of .5 Mi., Circle Area = 0.785398

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
60	Columbus	13215 222	0.115715	0.000961	0.83
61	Columbus	13215 223	0.142363	0.086894	61.04
63	Columbus	13215 231	0.441906	0.137569	31.13
64	Columbus	13215 241	0.369302	0.105496	28.57
75	Columbus	13215 273	0.079621	0.004321	5.43
76	Columbus	13215 274	0.095685	0.034711	36.28
80	Columbus	13215 281	0.047185	0.001601	3.39
82	Columbus	13215 283	0.162524	0.017098	10.52
83	Columbus	13215 284	0.229094	0.144314	62.99
84	Columbus	13215 285	0.048271	0.048271	100.00
85	Columbus	13215 286	0.058897	0.057266	97.23
86	Columbus	13215 287	0.029396	0.013180	44.84
87	Columbus	13215 288	0.030893	0.021499	69.59
137	Columbus	13215 224	0.112283	0.112283	100.00
===	=====	=====	=====	=====	=====
Totals:			1.963135	0.785465	

For Radius of .25 Mi., Circle Area = 0.196350

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
61	Columbus	13215 223	0.142363	0.035801	25.15
63	Columbus	13215 231	0.441906	0.024812	5.61
64	Columbus	13215 241	0.369302	0.009261	2.51
83	Columbus	13215 284	0.229094	0.002950	1.29
84	Columbus	13215 285	0.048271	0.016269	33.70
85	Columbus	13215 286	0.058897	0.003451	5.86
137	Columbus	13215 224	0.112283	0.103806	92.45
===	=====	=====	=====	=====	=====
Totals:			1.402117	0.196350	

Gaslight Co of Georgia
Columbus, GA

Gaslight Co of Georgia
Columbus, GA

===== Site Data =====

Population: 111640.83
Households: 47787.69
Drilled Wells: 18.12
Dug Wells: 0.00
Other Water Sources: 8.04

===== Partial (RING) data =====

---- Within Ring: 4 Mile(s) and 3 Mile(s) ----

Population: 35924.84
Households: 14473.63
Drilled Wells: 1.14
Dug Wells: 0.00
Other Water Sources: 5.91

** Population On Private Wells: 2.84

---- Within Ring: 3 Mile(s) and 2 Mile(s) ----

Population: 36584.81
Households: 15607.67
Drilled Wells: 11.56
Dug Wells: 0.00
Other Water Sources: 2.14

** Population On Private Wells: 27.10

---- Within Ring: 2 Mile(s) and 1 Mile(s) ----

Population: 25574.73
Households: 11483.33
Drilled Wells: 5.41
Dug Wells: 0.00
Other Water Sources: 0.00

** Population On Private Wells: 12.06

---- Within Ring: 1 Mile(s) and .5 Mile(s) ----

Population: 10060.38
Households: 4635.06
Drilled Wells: 0.00
Dug Wells: 0.00
Other Water Sources: 0.00

** Population On Private Wells: 0.01

Gaslight Co of Georgia
Columbus, GA

---- Within Ring: .5 Mile(s) and .25 Mile(s) ----

Population:	2410.47
Households:	1130.38
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

---- Within Ring: .25 Mile(s) and 0 Mile(s) ----

Population:	1085.59
Households:	457.63
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

** Total Population On Private Wells: 42.01

**COLUMBUS MANUFACTURED
GAS PLANT SITE**

**POSTREMEDIATION MONITORING
THIRD QUARTER 1993**

PREPARED FOR:

**JOHN H. JOHNSON, JR., ESQUIRE
TROUTMAN, SANDERS, LOCKERMAN, AND
ASHMORE
ATLANTA, GEORGIA
AS COUNSEL FOR**

**GEORGIA POWER COMPANY
ATLANTA, GEORGIA**

PREPARED BY:

**GEORGIA POWER COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
ATLANTA, GEORGIA**

DECEMBER 1993

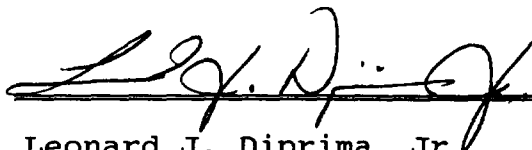
**COLUMBUS MANUFACTURED
GAS PLANT SITE
POSTREMEDIATION MONITORING
THIRD QUARTER 1993**

PREPARED FOR:

JOHN H. JOHNSON, JR., ESQUIRE
TROUTMAN, SANDERS, LOCKERMAN, AND
ASHMORE
ATLANTA, GEORGIA
AS COUNSEL FOR

GEORGIA POWER COMPANY
ATLANTA, GEORGIA

PREPARED BY:

 12/30/93

Leonard J. Diprima, Jr. Date
Georgia Registered Professional Geologist No. 949
Georgia Power Company Environmental Affairs Department



Table of Contents

<u>SECTION</u>	<u>PAGE</u>
List of Tables and Figures	ii
1.0 Background	1
1.1 Site Description and Previous Activities	1
1.2 Postremediation Monitoring Plan Objectives	2
2.0 Field Activities - Groundwater Sampling	4
3.0 Groundwater Flow	6
4.0 Analytical Results	7
4.1 Polynuclear Aromatic Hydrocarbons (PAHs)	7
4.2 Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)	7
4.3 Cyanide (Cn)	8
5.0 Statistical Procedures	9
6.0 Summary	10
References	11
Appendix A - Sampling Notes/Third Quarter 1993	
Appendix B - Monitoring Well Location Map/Groundwater Surface Map	
Appendix C - Groundwater Analytical Results/Third Quarter 1993	

List of Tables and Figures

<u>TABLE</u>	<u>TITLE</u>	<u>FOLLOWS PAGE</u>
1	Constituents to be Monitored/Columbus MGP Site Columbus, Georgia	4
2	Water Table Measurements/Columbus MGP Site / March 16, 1993	6
3	Groundwater Analytical Results / Third Quarter 1993	7
4	Comparison of Groundwater Analytical Results / Pre-remediation to Third Quarter 1993	7

FIGURE

1	Groundwater Elevation Contour Map / July 30, 1991	7
2	Total PAHs in Groundwater	7
3	BTEX in Groundwater	7
4	Benzene in Groundwater	8
5	Total Cyanide in Groundwater	8

COLUMBUS MGP SITE POSTREMEDIATION MONITORING THIRD QUARTER 1993

1.0 Background

1.1 Site Description and Previous Activities

The Columbus Manufactured Gas Plant (MGP) is located in the southwest section of the central business district of Columbus, Georgia between the Chattahoochee River and Bay Avenue. The site is bordered on the south by a Georgia Power substation and Dillingham Street, and on the north by the City of Columbus park development.

The first MGP operations were conducted on the site in 1854. Manufactured gas was produced at the site from 1854 until 1931 by three different processes, which were wood (1854-1865), coal (1865-1928), and carbureted water gas (1918-1931). Manufacturing operations ceased in 1931 when natural gas was introduced. Since that time the site has been used for various industrial service activities.

The site was the subject of extensive assessment activities in 1990 and 1991. Assessment activities were conducted to determine the extent of MGP materials in the soil. Following assessment activities, a site remediation plan was developed which utilized an in-situ solidification process to stabilize and immobilize the

contaminants. Site remediation began in January 1992 and was completed in June 1992. Since that time the City of Columbus has completed construction a park along the Chattahoochee River which includes the former MGP site.

Upon receiving the City of Columbus permission to proceed, implementation of the Postremediation Monitoring Plan (Georgia Power, 1992) was begun in December 1992 by installing monitoring wells around the solidified material.

1.2 Postremediation Monitoring Plan Objectives

A Postremediation Monitoring Plan (Georgia Power, 1992) was prepared and submitted to the Georgia Environmental Protection Division (EPD), Hazardous Waste Branch, in June 1992. The objective of the plan is to confirm the effectiveness of the remediation efforts and to monitor for potential releases of MGP constituents from the site.

The scope of work for this monitoring plan included the following:

- Installation of nine monitoring wells in the water table aquifer above the confining (saprolite) layer,
- Installation of one monitoring well below the saprolite layer within the bedrock aquifer,
- Conduct permeability test on the monitoring wells,
- Collect and analyze groundwater samples,
- Monitor static water levels, and

- Conduct periodic surface water observation.

The installation of ten groundwater monitoring wells, permeability tests on each well, and three quarterly rounds of groundwater sampling and surface water observations has been completed for 1993.

2.0 Field Activities

2.1 Groundwater Sampling

Groundwater sampling will be conducted on the installed monitoring wells on a quarterly basis for the first year, and semi-annually for the next four years. After the five year period, the monitoring plan will be reassessed to determine if there is need for further monitoring. Any decisions made regarding the monitoring plan will be submitted to the EPD for concurrence.

The third round of quarterly sampling was conducted in August 1993. All sampling was conducted per the methods stated in the postremediation monitoring plan. Each well was checked prior to purging with a hydrocarbon interface probe for LNAPLs and DNAPLs. None were detected. Each well was purged a minimum of three well volumes, and allowed to recover prior to sampling. All sampling was conducted within 24-hours of purging. Samples were collected from each well for volatile organic compounds (VOCs by U.S. EPA SW-846 Method 8240), polynuclear aromatic hydrocarbons (PAHs by U.S. EPA SW-846 Method 8270), total cyanide (Total Cn by U.S. EPA SW-846 Method 335.2) and cyanide amenable to chlorination / free cyanide (Free Cn by U.S. EPA SW-846 Method 335.1). The individual constituents analyzed for are listed in Table 1. Field notes for this sampling event are in Appendix A.

A visual observation of the surface waters along the river bank

TABLE 1
Constituents to be Monitored
Columbus MGP Site
Columbus, Georgia

ANALYTE	TEST METHOD
VOCs	
Benzene	U.S. EPA SW-846 Method 8240
Toluene	8240
Ethylbenzene	8240
Xylenes	8240
PAHs	
Napthalene	U.S. EPA SW-846 Method 8270
2-Methylnapthalene	8270
Acenaphthylene	8270
Acenaphthene	8270
Dibenzofuran	8270
Fluorene	8270
Phenathrene	8270
Anthracene	8270
Fluoranthene	8270
Pyrene	8270
Chrysene	8270
Benzo(a)anthracene	8270
Benzo(b)fluoranthene	8270
Benzo(k)fluoranthene	8270
Benzo(a)pyrene	8270
Indeno(1,2,3-cd)pyrene	8270
Dibenz(a,h)anthracene	8270
Benzo(g,h,i)perylene	8270
CYANIDE	
Cyanide (total)	U.S. EPA Method 335.2
Cyanide (free)	U.S. EPA Method 335.1

in front of the MGP site were also made at this time. No seeps of MGP materials were detected, therefore no surface water samples were collected during this quarter. Field notes of the surface water observations can be found in Appendix A.

3.0 Groundwater Flow

Water table measurements collected on August 15, 1993, presented in Table 2, were used to construct the water table surface map in Appendix B. Groundwater flow is to the west, generally as it was prior to remediation. Flow is, however, influenced locally by the solidified block. The lower effective permeability (k) and hydraulic conductivity (K) of the solidified material has caused the majority of groundwater flow to be diverted around the block, flowing through the more conductive unsolidified soils.

TABLE 2
Water Table Measurements
Columbus MGP Site
August 15, 1993

Well No.	Well Sounding	Top of Casing Elevation (ft)	Depth to Groundwater (ft)	Groundwater Elevation (ft)
GPC-1	38.40	233.60	30.35	203.25
GPC-2	46.25	233.13	34.96	198.17
GPC-3	39.90	233.12	37.58	195.54
GPC-4	31.60	223.62	25.75	197.87
GPC-5	29.50	219.31	27.93*	191.38
GPC-6	46.50	232.89	31.07	201.82
MW-7	42.70	231.90	29.25	202.65
GPC-8D	58.15	223.23	31.00	192.23
GPC-9	42.25	233.01	32.50	200.51
GPC-10	50.90	234.01	31.72	202.29

* = Well was dry on August 16, 1993

4.0 Analytical Results

4.1 Polynuclear Aromatic Hydrocarbons (PAHs)

Analytical results for PAHs for the third round of sampling, 1993, indicate that no PAHs on the target list were detected above standard detection limits (See Table 3). Groundwater data from monitoring wells utilized during the site investigation (See Figure 1) was used to compare to data from the first and second round of monitoring data for 1993 to show how contaminant concentrations have decreased as a result of remediation. The current monitoring points are not in the exact location as the original wells utilized during the investigation, therefore, the investigation well which was closest to the current post-remediation monitoring well was used for original contaminant data. Figure 2 demonstrates how total PAH concentrations in the groundwater have reduced from pre-remediation levels ranging from 551 ppb to 6414 ppb to current concentrations below standard detection limits (10 ppb per constituent). Analytical data can be found in Appendix E.

4.2 Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)

Analytical results for the third round of sampling, 1993, indicate that no BTEX constituents were detected above standard detection limits (See Table 3). Figure 3 demonstrates how total BTEX concentrations in groundwater have declined from pre-remediation levels ranging from 7 ppb to 618 ppb to current levels below detection limits (5 ppb per constituent). Benzene

TABLE 3
Groundwater Analytical Results
Third Quarter 1993

ANALYTE (ppb)	GPC-1	GPC-2	GPC-3	GPC-4	GPC-5	GPC-6	MW-7	GPC-8D	GPC-9	GPC-10
Benzene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Xylenes (total)	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Napthalene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
2-Methylnapthalene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Dibenzofuran	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Phenanthrene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Anthracene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Fluoranthene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Pyrene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Benzo(a)anthracene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyre.	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	NT	BDL	BDL	BDL	BDL	BDL
Cyanide (total)	BDL	BDL	30	BDL	NT	BDL	BDL	BDL	BDL	BDL
Cyanide (free)	BDL	BDL	20	BDL	NT	BDL	BDL	30	BDL	BDL

BDL = Below Detection Limits (for individual constituents see analytical)
NT = Not Taken, well was dry.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Jefferson														X			X				X													
Jenkins														X	X		X				X													
Johnson														X			X																	
Jones																					X													
Lamar																					X													
Lanier															X	X						X												
Laurens															X	X					X													
Lee															X																			
Liberty	X								O	O	X	O	O	X	X	X	X	X	M	W	X								O	O	O	O	O	S
Lincoln																																		
Long	X													X	X						X		X											
Lowndes														X	X			X			X						X							
Lumpkin																																		
McDuffee																					X													
McIntosh	X								O	O	X	O	O	X	X	X	X	X	M	W									O	O	O	O	O	S
Macon														X	X																			
Madison																																		
Marion														X																				
Meriwether																					X													
Miller														X	X																			
Mitchell														X	X																			
Monroe																		X																
Montgomery	X													X	X						X													
Morgan																												X						
Murray					X	X																						X						
Muscogee														X							X						X							
Newton																																		
Oconee																																		
Oglethorpe																																		
Paulding																					X													
Peach														X																				
Pickens																																		
Pierce														X	X						X													
Pike																					X													
Polk																											M							
Pulaski	X													X																				
Putnam																					X													
Quitman														X				X																
Rabun																		R									X							
Randolph														X																				

X=General occurrence, see appendix; O=Occurs in offshore waters only;
W=Winter occurrence only; S=Summer occurrence only; M=Occurs irregularly
as a migrant; R=Release or potential release site; H=Historical occurrence

OVERSIZED

DOCUMENT

NUS CORPORATION AND SUBSIDIARIES		TELECON NOTE
CONTROL NO.	DATE: April 9, 1990	TIME: 1030
DISTRIBUTION: File The Gas Light Co. of Columbus (coal gas facility) Columbus, Georgia		
BETWEEN: Bobby Gaylor	OF: United Cities Gas Co.	PHONE: (404) 576-2900
AND: David Brown, NUS Corporation <i>DB 5/25/90</i>		
DISCUSSION: Mr. Gaylor stated the Gas Light Company of Columbus went under new ownership in 1948 and now is under the name of United cities Gas Company as of 1982. Mr. Gaylor said that old coal gas plant stopped operating around 1920 and all buildings and tanks were removed. He said there may have been a disposal pit on the property, he was unaware of what was done with the waste from the facility. Mr. Gaylor said the United Cities Company service center is located on top of the old coal gas plant site, he did not have the dimensions of the old gas plant. The service center "Old Coal Gas Plant location" is located at 945 Bay Avenue, Columbus, Georgia 31993. For further information contact: Mr. Bobby Gaylor 404-576-2900		

PB85-173813

**Survey of Town Gas and By-Product
Production and Locations in the U.S.
(1880-1950)**

Radian Corp., McLean, VA

Prepared for

**Environmental Protection Agency
Research Triangle Park, NC**

Feb 85

**U.S. Department of Commerce
National Technical Information Service**

NTIS

PB85-173813

EPA/600/7-85/004
February 1985

SURVEY OF TOWN GAS AND BY-PRODUCT
PRODUCTION AND LOCATIONS IN THE U.S.
(1880-1950)

by

Robert Eng

Radian Corporation
7655 Old Springhouse Road
McLean, Virginia 22102

EPA Contract No. 68-02-3137

EPA Project Officer:

William J. Rhodes
Advanced Processes Branch
Air and Energy Engineering Research Laboratory
Research Triangle Park, North Carolina 27711

AIR AND ENERGY ENGINEERING RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

CONTENTS

Foreword	iii
Figures.	vi
Tables	vii
Conversion Factors and Definitions of Symbols.	viii
Abstract	ix
1. Introduction.	1
Background	1
Project Overview	2
2. Approach and Results.	5
General Section Description.	5
Source of Data	5
Site Identification Tables and Maps.	7
Estimation of Tar Production	33
Other By-Products	39
References	41
Appendices	
A. Background Information on Data Source and Processes	A-1
B. Identification of Town Gas Manufacturing Sites - All Plants (1890-1950).	B-1

TABLES

<u>Number</u>		<u>Page</u>
1	Summary of Town Gas Sites and Production by State (1880-1950)	8
2	Summary of Town Gas Manufacturing Sites and Average for Large Plants (>200 MM scf/yr.) . . .	12
3	History of Number of Sites and Production of Town Gas for 1889 to 1950.	21
4	Summary of Town Gas and Tar Production by State (1880 to 1950).	34
5	Rank of U.S. States/Territories According to Estimated Tar Production for the Time Period, 1880 to 1950	36
6	By-Product Disposition	41
B-1	Identification of Town Gas Manufacturing Sites - All Plants (1890-1950)	E-8

Appendix A

BACKGROUND INFORMATION ON DATA SOURCE AND PROCESSES

SAMPLE PAGES FROM BROWN'S DIRECTORY OF AMERICAN GAS COMPANIES

This part contains example pages from the 1890 and 1950-1951 editions of Brown's Directory of American Gas Companies. These example pages show the extent and detail to which data are reported by Brown's, as well as the changes in the reported data from 1890 to 1950. These example pages, which are copyrighted, are used here with the permission of Harcourt Brace Jovanovich Publications, the publishers of Brown's Directory of American Gas Companies.

DESCRIPTION OF VARIOUS MANUFACTURED GAS TYPES

This part briefly describes the various manufactured gas types and their distinguishing characteristics. There are three different major types of manufactured gas:

1. Coal
2. Water
3. Oil

Manufactured gas can also be sold as a mixture of the above gases. These three types are distinguished by their composition and respective processes of manufacture. This study is primarily concerned with coal and water gases because the large majority of manufactured gas consists of these two types. Each gas type is described separately below.

Coal Gas

Coal gas is produced from the heat treatment of coal in a closed vessel, or retort, a process known as carbonization. This process produces a combustible gas comprised mainly of hydrogen and methane which has a typical heating value between 400 and 550 British Thermal Units (BTU)/cubic foot. The primary by-products that result from carbonization are coke, tar, and ammonia.

Water Gas

Water gas was usually used to supplement the production of coal gas in order for gas manufacturers to meet cyclic demands. Water gas is produced from passing steam (thus the term "water gas") through hot coke to form a gas comprised

mainly of hydrogen and carbon monoxide. Heat treatment of coke or oil to produce gas was known as gasification, whereas carbonization referred to the heat treatment of coal. Water gas typically has a heating value of approximately 300 BTU/cubic foot and is non-luminous (i.e., it has negligible illuminance when combusted) due to the lack of rich hydrocarbons. Because town gas was used primarily for lighting purposes in the 1800s, it was desired to "enrich" the water gas, usually by the addition of gas produced from the cracking of oil, to form "carburetted water gas". The oil gas, having a higher heating value (approximately 1,700 BTU/cubic foot) and hydrocarbon content than water gas, resulted in a gas mixture that was comparable to coal gas (in terms of heating and illuminating values). The carburetted water gas was also amenable to the same purification processes as coal gas although less coke, tar, and ammonia production were characteristic of water gas production compared with coal gas production.

Oil Gas

Gas produced from oil as the main raw material was less commonly used compared with coal and water gas due to the relatively high cost of oil gas production. As described above, oil gas was typically used to enrich water gas. Oil gas was usually produced from the thermal cracking of oil, a process known as oil gasification. The cracking was achieved by the spraying of oil via a carburettor (thus the term "carburetted water gas") onto hot brickwork or a bed of selected catalyst. The primary by-products resulting from oil gasification were typically oil derivatives, tar, and naphthalene.

Additional discussion of the manufacturing processes and gas types may be found elsewhere (Reference 3).

Appendix B

IDENTIFICATION OF TOWN GAS MANUFACTURING SITES - ALL PLANTS (1890 - 1950)

This appendix contains the detailed data concerning gas production, by-product production, and manufacturing processes reported for each decennial year for each plant. The following explains the information included under each column heading of the table:

City - This column heading contains the city name in which the reported plant is located. The cities are arranged first by chronological order (based on the first decennial year in which the site was found in Brown's) and then alphabetically by city name. As mentioned above, there is almost always a one-to-one correspondence between city entries and plant sites. There were, however, instances where several sites were listed under a single city entry. This was usually a result of consolidation of nearby plants that were listed separately in previous years. Thus, these previously listed plant sites are separately included in the total site tally (see Table 1). Although local addresses were reported in later editions of Brown's, these were not included because the reported address did not necessarily refer to the plant site (the address may refer to non-manufacturing locations; e.g., main office).

Year - This column lists the decennial years for which data were compiled (from 1890 to 1950). These years are repeated for each city entry.

Status - The symbol in this column (refer to legend) indicates the status for a particular year. The possibilities are that the plant (in that year):

1. Manufactured gas (*),
2. Purchased gas (P),
3. Only supplied natural gas (N),
4. Did not report data, or no information was found (0),
5. Discontinued operation (X), or
6. Was not yet in existence (blank); e.g., under construction

Once it was determined that a plant was a natural gas supplier, solely a purchaser of gas, or discontinued gas manufacturing operations, data for subsequent years were not compiled. This is indicated by a "-" under the status column.

Gas Type - The entry under GAS TYPE indicates the specific type of manufactured gas: coal, water (or carburetted water), oil, or other. The definition of each gas type is given in Appendix A. It is possible that more than one type of gas was produced; this is indicated by multiple entries under GAS TYPE separated by commas. For example, the entry, "C,W", means that both coal and water gas were produced that year.

The gas type was usually either specified in the reported annual production or determined from the listing of process of manufacture. For example, the use of the Lowe process almost invariably indicates the production of water gas. When the gas type could not be determined from the available information, a "?" was entered under GAS TYPE. Occasional inconsistencies were found between the annual production and the process of manufacture information reported in Brown's. These were attributed to the subjective nature of the surveys, on which the reported data were based. In these cases, the annual production information was considered more reliable than the reported process of manufacture.

Gas Production Rates - Annual gas productions are reported separately for coal, water, oil, and other types of manufactured gas in units of million standard cubic feet under this column (rounded to the nearest MM scf). The production for carburetted water gas, which is essentially enriched water gas (see Appendix A), was included in the water gas column. "Other" types of manufactured gas usually referred to coke oven based gas. The sum of these productions for a particular plant is also shown for each year. This sum, however, does not include values enclosed in parentheses or brackets, which are discussed next. Whenever production data were not reported in Brown's, the following information was reported instead (listed in order of decreasing reliability):

1. Annual sales - This is usually equivalent to the annual production unless the company consumes (within the plant) or purchases significant amounts of gas.
2. Half of the maximum yearly output - The annual production can be estimated as 180 days/year times the maximum daily sendout, or one-half of the maximum annual output. This is based on a rule of thumb reported in Brown's. This estimate is shown in square brackets and is not included in the totals or average productions.
3. Population served - The annual production can be roughly estimated as one million cubic feet/1,000 of population served based on a judgment of the correlation between population served and gas production. This estimate is shown in parentheses (in units of 1,000 of population or million cubic feet of gas) in Table B-1 and is not included in the total or average production. This information is reported only when the above data were unavailable.

Where none of the above information was available, a "?" is shown under this column.

Occasionally, only one production was reported in Brown's although it was determined that more than one gas type was being produced (almost always coal and water gas), as indicated in the GAS TYPE column. In these cases, it was assumed that coal gas was produced and the production was entered in this column.

Gasifier/Process - The process of manufacture or gasifier type is shown in this column as reported in Brown's. Due to the variety in water gas processes (See Appendix A), the particular water gas process was usually specified whereas details regarding the manufacture of coal gas were reported infrequently. The indication of a particular process does not signify that only the associated gas type is produced; the gases that are produced are shown in the GAS TYPE column.

By-Product Production Rate - The amounts of coke, tar, ammonia, or other by-products of concern are reported separately under this column. The sum of these by-product productions for each year was not calculated because each type of by-product production is reported in different units (refer to legend for corresponding units). As can be seen from Table B-1, such data were not available in Brown's until 1920. For a significant portion of the plants, the amounts of by-product made and sold were reported (most frequently for coke). In these cases, the net amount (difference between by-product made and sold) is reported (in parentheses) because it is this unaccounted for amount that is important in this study. When the amount sold is greater than the amount made, a "(-)" is shown. Such negative values can be attributed to sale of by-products produced either in other years or from non-gas manufacturing operations. The net values are not included in the calculated average. Unsold by-products are the materials that may have become wastes and disposed of.

Miscellaneous Information - Information typically shown in this column includes details of "other" types of gases or by-products, consolidations of companies, multiple sites, and unconventional feedstocks.

Average Productions - The average production rates shown in the last line of data for each plant are the calculated average values of the plant data reported directly above. Estimated gas production (as indicated by parentheses or brackets) or net by-product productions were not included in these calculated average values.

It should be noted that these values are averaged for only the years in which production of each particular type of gas was produced. The calculations used to arrive at these values were discussed in the subsection explaining Table 2.

LEGEND FOR TABLE B-1

STATUS

- * - Manufactured gas for that year
- X - Discontinued/Out of business that year
- O - Not found for that year
- C - Consolidated with another company (see comments)
- N - Natural gas supplier for that year
- P - Gas purchased from another firm that year

COMPANY

- " - "City name"
- G - Gas
- E - Electric
- F - Fuel
- L - Light
- H - Heat
- P - Power
- Mfg - Manufacturing
- Co - Company

GAS TYPE

- C - Coal gas
- W - Water gas
- CW - Carburetted water gas
- O - Oil gas
- N - Natural

GAS PRODUCTION RATE

- # - Production rate of gas in million standard cubic feet (MM scf)
- (#) - Population served in 1,000 (reported when production unavailable)
- [#] - Production rate estimated from 1/2 of maximum output (MM scf)

GASIFIER/PROCESS

- F - Flannery
- G - Granger
- H-L - Hanlon
- J - Jermanowski
- J(B) - Jermanowski (baby)
- J-L - Janeway-Logan (Oil)
- K - Kendall (Oil)

LEGEND FOR TABLE B-1 (continued)

GASIFIER/PROCESS (Continued)

M-C - McKay-Critchelow
P - Patton (Oil)
S - Springer
S-G - Smith-Goldthorpe
V-Si - Van Sickel (Oil)
V-St - Van Steenburgh
W - Wilkinson

BY-PRODUCT PRODUCTION RATE

Coke - a x 10³ tons of coke produced that year;
(a)x 10³ tons of coke unaccounted for that year
(calculated as coke made minus coke sold).

Tar - b x 10³ gallons of tar produced that year.

Ammonia - c x 10³ lbs of ammonia produced that year.

Other - Amount of by-products, other than above, produced and reported that year (see MISCELLANEOUS INFORMATION for more details).

TABLE B-1 (continued)

STATE: GEORGIA

NO.	CITY	YEAR	STATUS	GAS TYPE	GAS PRODUCTION RATE		GAS CO. PL. /YR	GAS FEE/	GAS PRODUCTION				REMARKS
					Coal	Water	Oil	Gas	Coal	Gas	Oil	Gas	
1	Americus	LAP Co	1970	•	•	1100		•					
			1980	•	•	7		•					
			1910	•	•	10		7					
			1920	•	•	20		20					
			1930	•	•	20		20					
			1940	•	•	0		0					
			1950	•	•	4		4					
			AVERAGES:			13		13					
2	Athens	• RL Co & E Co	1970	•	C	1000							
			1980	•	C	0		0					
			1910	•	C	10		10					
			1920	•	C	30		30					
			1930	•	C	30		30					
			1940	•	C	71		71					
			1950	•									
			AVERAGES:			37		37					
3	Atlanta	• RL Co	1970	•	C	100		100					
			1980	•	C	203		203					
			1910	•	•	670		670					
			1920	•	•	1,400		1,400					
			1930	•	C, H	947		1,300					
			1940	•									
			1950	•									
			AVERAGES:			210		1,120					
4	Atlanta	Sole City RL Co	1970	•	•	37		37					
			1980	•									
			1910	•									
			1920	-									
			1930	-									
			1940	-									
			1950	-									
			AVERAGES:			37		37					

(continued)

TABLE B-1 (continued)

STATE: GEORGIA

NO.	CITY	COMPANY	YEAR	STATUS	WELL TYPE	GAS PRODUCTION RATE MM cu. ft./hr				PERCENTAGE OF TOTAL PRODUCTION				PERCENTAGE OF TOTAL PRODUCTION				REMARKS
						Coal	Oil	Gas	Total	Coal	Oil	Gas	Total	Coal	Oil	Gas	Total	
3	Augusta	* B. Co.	1870	+	C	130												
			1900	+	C	25			25									
			1910	+	B			10	10									Less
			1920	+	B			100	100									
			1930	+	B			225	225									62
			1940	+	B			150	150									
			1950	+	B			700	700									
			REMARKS:			25	203		227									62
5	Brunswick	* L. M. Co.	1870	+	C	5			5									
			1900	+	C	5			5									
			1910	+	C	5			5									
			1920	+	C	5			5									
			1930	+	C	3			3					2	12			Most gas produced
			1940	+														
			1950	+										2	12			
			REMARKS:			5			5					2	12			
7	Columbus	Empire M. & W. Co.	1870	+	?				?									
			1900	+														
			1910	+														
			1920	+														
			1930	+														
			1940	+														
			1950	+														
			REMARKS:															
8	Cartersville	* Improvement L. & Co.	1870	+	B			100										
			1900	+	B			2	2									
			1910	+	C	5			5									
			1920	+	C	5			5					10	3			9
			1930	+	C	5			5									
			1940	+	C	2			2									
			1950	+														
			REMARKS:			5		2	4					3	9			

(continued)

TABLE B-1 (continued)

STATE: GEORGIA

NO.	CITY	COMPANY	YEAR	STATUS	MINE TYPE	1945 PRODUCTION RATE (Tons per ft. / day)			GROSS/PRICE	1945 PRODUCTION (Tons)				REMARKS	
						Coal	Water	Oil		Coal	Tar	Gas	Other		
9	Columbus	The M. Co. of *	1930	•	M			13		13					
			1940	•	M			15		15					
			1910	•	M			25		25					
			1920	•	M			70		70					
			1930	•	M			150		150					
			1940	•	M										
			1950	•	M										
AVERAGE:								63		63					
10	Dalton	* M. Co.	1930	•	T					140					
			1940	•	C			4		4					
			1910	•	C			50		50					
			1920	•	C			50		50					
			1930	•	C			130		130					
			1940	•	C			23		23					
			1950	•	M										
AVERAGE:								32		32					
11	Hiram	* M. Motor Co.	1930	•	C			37		37	Marble				
			1940	•	C			40		40					
			1910	•	C			50		50	Lean				
			1920	•	C, M			100	50	150					
			1930	•	M			6		6					
			1940	•	M										
			1950	•	M										
AVERAGE:								65	50	67					
12	Stone	* M. Co.	1930	•	C			5		5					
			1940	•	C			7		7					
			1910	•	C			17		17					
			1920	•	C			20		20					
			1930	•	C, M			20	7	25					
			1940	•	M										
			1950	•	M										
AVERAGE:								15	7	17					

(continued)

TABLE B-1 (continued)

STATE: GEORGIA

REL.	CITY	COMPANY	YEAR	S-1000	C&E TYPE	GAS PRODUCTION RATE		GAL. CO. FL. / YR	GAL. USED /	PERCENTAGE		PERCENTAGE		REMARKS
						Gas	Water	Oil	Gas	Total	PRICE	Cost	Per Barrel	Oil
13	Barnesville	Nelson B. Co.	1890	•	B			30		30				
			1900	•	B			20		20				
			1910	•	B			140		140				
			1920	•	B			253		253			100	
			1930	•	B			420		420			200	
			1940	•	CH			420		420			700	
			1950	•	CH			700		700			1,400	
			AVERAGE:					340		340			643	
14	Thomasville	• B Co.	1890	•	B			77						
			1900	•	B			4		4				
			1910	•										
			1920	•										
			1930	•										
			1940	•										
			1950	•										
			AVERAGE:					4		4				
15	Valdosta	• B Co.	1890											
			1900											
			1910	•	C	100								
			1920	•	C	80				80		65.4	80	
			1930	•	C, H	40	7			20		1	200	
			1940	•	C	44				44		65.4	40	
			1950	•										
			AVERAGE:			27	7			40		1	207	
16	Albany	• San Maria	1890											
			1900											
			1910											
			1920	•	B		22			22			8	
			1930	•	B		20			20			15	
			1940	•	CH		70			70				
			1950	•										
			AVERAGE:				20			20			10	

(continued)

TABLE B-1 (continued)

STATE: GEORGIA

NO.	CITY	YEAR	STATUS	AND TYPE	GAS PRODUCTION RATE (cu. ft./hr)			GASIFIER/ PROCESS	PERCENTAGE PRODUCTION			REMARKS
					Coal	Motor	Oil		Coke	Total	Coal	
17	Griffin	1910	•	Icefield Storage								
18	La Grange	1910	•	Municipal S Plant								
19	Way Cross	1910	•	Compressor's OilCoke Co								

(continued)

